

Technology Grade 8

By:
Siyavula Uploaders

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By:

Siyavula Uploaders

Online:

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C O N N E X I O N S

Rice University, Houston, Texas

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Chapter 1

Term 1

1.1 Structures¹

1.1.1 TECHNOLOGY

1.1.2 Grade 8

1.1.3 STRUCTURES

1.1.4 Module 1

1.1.5 STRUCTURES

Introduction

- You have already become acquainted with technology and the process that we follow to solve problems. This module aims to equip you to accept a challenge involving structures. You will be guided through the process so that you can compile your own portfolio when you face the challenge at the end of the chapter. You will also be doing focus tasks to improve your ability to communicate graphically, which will help you when you have to produce sketches and do a presentation to introduce your work.
- Keep the portfolio in mind:

Technology projects frequently involve solving some kind of problem. There are particular steps that have to be followed in such an instance. These steps involve the technological process. This process does not comprise a set of rules to be followed, but has guidelines, or steps, that help you to solve the problem logically and meaningfully.

The portfolio is the “story” of how you plan to go about solving the problem. It could consist of a text, pictures, sketches, formal drawings, questionnaires, photographs, etc. It should sum up each step of the project from beginning to end. Your educator will show you an example of such a portfolio.

Activity 1

Structures

- Just about everything surrounding us is a structure of some kind, or forms part of a structure. You might think of buildings, cranes, bridges, etc. We easily forget that nature also provides many structures. Just think of a spider’s web, for instance, your skull, or the carapace of a tortoise. Structures are divided into two main groups:

¹This content is available online at <<http://cnx.org/content/m23736/1.1/>>.

Natural structures and man-made structures



Figure 1.1

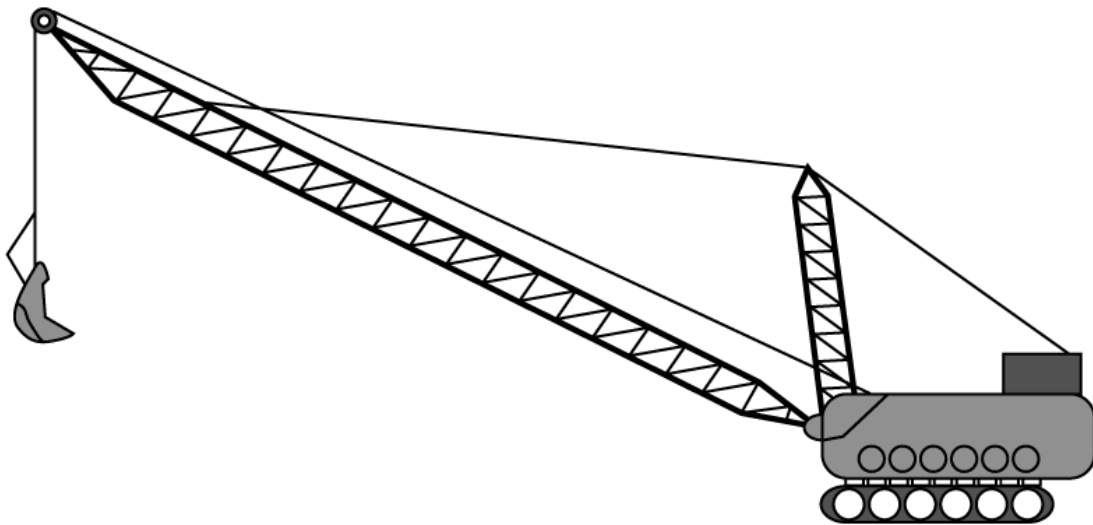


Figure 1.2

- People manufacture structures in workshops and factories. All products manufactured by people have structure, even the containers in which products are packaged.

Functions of structures:

Structures have the following functions:

Support, e.g. a chair



Figure 1.3

Protection, e.g. the carapace of a tortoise



Figure 1.4

Bridging a gap, e.g. a bridge

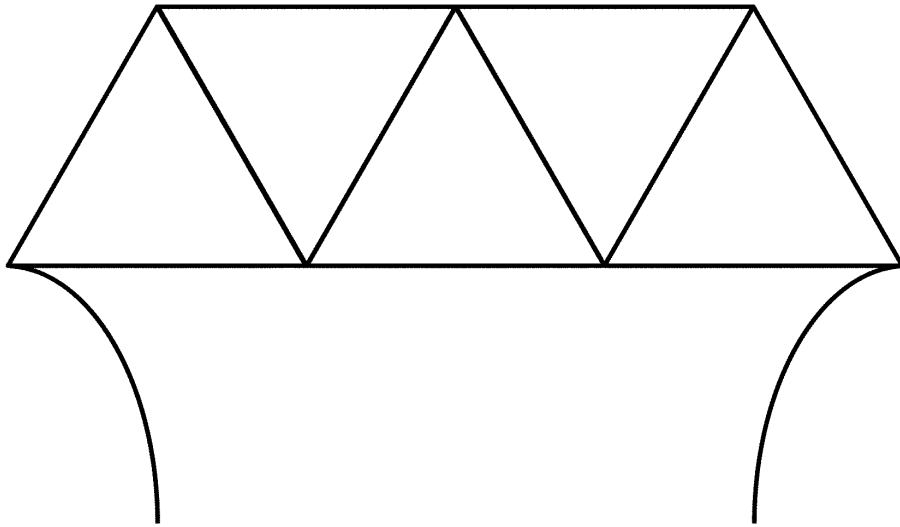


Figure 1.5

- Structures are divided further into **framing structures** and **casing/capsular structures**. The function and the shape of a structure determine whether it is classed as a frame or casing/capsule. A pair of glasses has a framing structure, while your home has a casing/capsular structure. Both are manufactured by people.

Assignment 1

- This assignment requires that you identify and describe the structures of a house.



Figure 1.6

- Create a table like the following:

ITEM	CASING / FRAME	FUNCTION
E.g. roof trusses	Frame	Strengthens and supports

Table 1.1

- Complete the task according to the following guidelines:
- Identify the structures of the house. You could also identify common items inside the house, e.g. tables and chairs.
- Classify these items as frames or capsules/casings.
- Indicate the function of each item.

	LO 2.1			

Table 1.2

1.1.6 Assessment

LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
structures:2.1 demonstrate knowledge and understanding of frame structures:
<ul style="list-style-type: none"> • the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); • reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); • how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability;
<i>continued on next page</i>

processing:2.2 demonstrates a knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:

- to withstand forces (tension, compression, bending, torsion, shear);
- to increase strengths or life-span;
- how specific properties suitable for packaging can be achieved.

Table 1.3

1.1.7 Memorandum

ACTIVITY 1

- The leaf : Encourage the learners to mention further examples of natural structures and to record these in the vacant space surrounding the leaf. The same is applicable to the crane and the examples used to illustrate particular functions .

Assignment 1

- Consider letting each learner build a cardboard model of a house in advance.
- Allow a fair amount of time for discussion of the learners' tables so that a maximum number of structures can eventually be listed. The list of examples provided below is incomplete.

ITEM	CASING /FRAME	FUNCTION
Walls	Shell/casing	Support, protection
Lintels	Frame	Reinforcement/strengthening
Door and window frames	Frame	Support, bridging
Roof trusses	Frame/casing	Bridging, support
TV cupboard	Frame/shell	Protection
Roof	Shell	Protection
Door frames	Frame	Support
Railings	Frame	Support
Curtain rails	Frame	Support
Chairs	Frame	Support
Tables	Frame /shell	Support / bridging
Shelves	Frame	Support

Table 1.4

1.2 Forces and Structures²

1.2.1 TECHNOLOGY

1.2.2 Grade 8

1.2.3 STRUCTURES

1.2.4 Module 2

1.2.5 FORCES AND STRUCTURES

Activity 1

Forces and Structures

- Structures sag or give way when they are not strong enough to resist the forces that are brought to bear on them. If you are sitting on a chair, the force that you exert on that chair is **static**. If you rock to and fro while you are on the chair, the force is in motion and we speak of **dynamic force**.



Figure 1.7

Static Force

²This content is available online at <<http://cnx.org/content/m23739/1.1/>>.



Figure 1.8

Dynamic Force

- We identify the following forces:

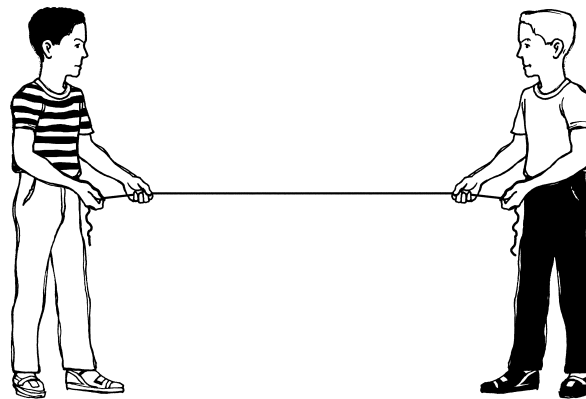


Figure 1.9

Stress



Figure 1.10

Compression



Figure 1.11

Flexure



Figure 1.12

Shearing
Assignment 1

1. You need to support your pencil case above the surface of your desk. The only thing that you have to help do this, is an A4 sheet of paper. Fold the paper in such a manner that you create a structure strong enough to act as support.

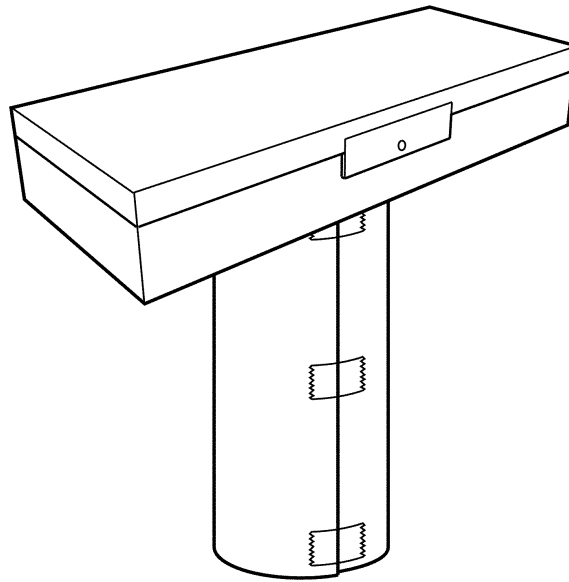


Figure 1.13

1. Place two space cases 250 mm apart. Use one A4 sheet of paper to create the strongest bridge possible by means of folding to span the gap between the space cases. Test the various bridges with a variety of weights to determine which is the strongest.

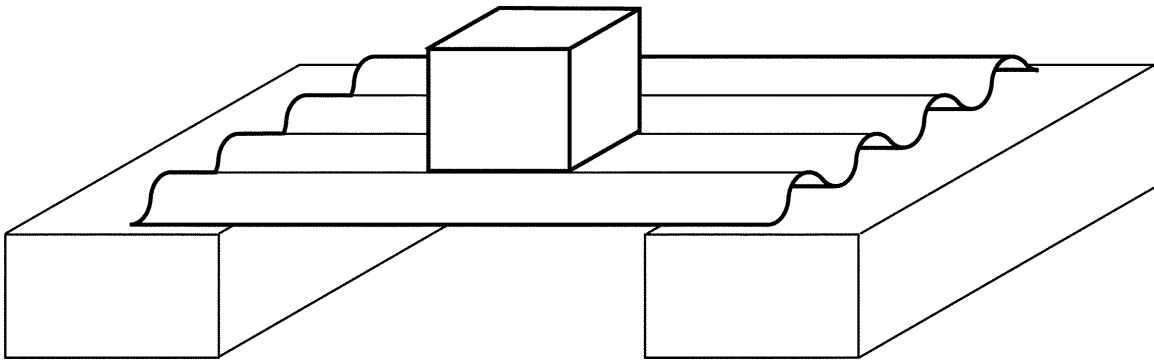


Figure 1.14

	LO 1.3			

Table 1.5

1.2.6 Assessment

Learning Outcomes(LOs)
LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.3 develops and performs practical tests in the technological areas (Structures, Processing, and Systems and Control);
1.4 uses appropriate technologies and methods to:
<ul style="list-style-type: none"> • collect relevant data from different sources and resources; • extract relevant data; • make meaningful summaries;use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below:
<ul style="list-style-type: none"> • people: age target market; • purpose: function; • appearance: colour, shape; • environment: where will product be used; • safety: for users; • cost: cost of materials;
<i>continued on next page</i>

1.7 generates several alternative solutions and writes notes, ideas that show some links to the design brief and specifications;
makes:1.9 develops a plan for making that outlines all of the following:
<ul style="list-style-type: none"> • resources needed; • sketches showing the necessary dimensions or quantities; • all steps necessary to making the product;

Table 1.6

1.2.7 Memorandum

ACTIVITY 1

- Encourage the learners to illustrate the four types of force by means of additional examples.

Assignment 1

1. Let the learners offer other ideas and discuss each idea (e.g. will a rectangular 'pillar' be stronger or weaker? Will a slender double-walled pillar (with the paper overlapping) be stronger than a more stocky pillar with single-layer walls?)
 2. Let the learners decide which factors determine strength: e.g. more shallow folds or fewer deeper folds, the type of paper, etc.
- Allow sufficient time for learners to name examples from their daily environment. The class could discuss the examples and suggest improvements.

1.3 Reinforcing structures³

1.3.1 TECHNOLOGY

1.3.2 Grade 8

1.3.3 STRUCTURES

1.3.4 Module 3

1.3.5 REINFORCING STRUCTURES

Activity 1

How do we reinforce structures?

- Rectangular objects are not necessarily sturdy. A rectangle can convert to a rhombus quite easily when force is exerted on it. The triangle is the figure that provides the greatest degree of stability. Consider the framework of a bicycle. Are there any triangles?

³This content is available online at <<http://cnx.org/content/m23741/1.1/>>.



Figure 1.15

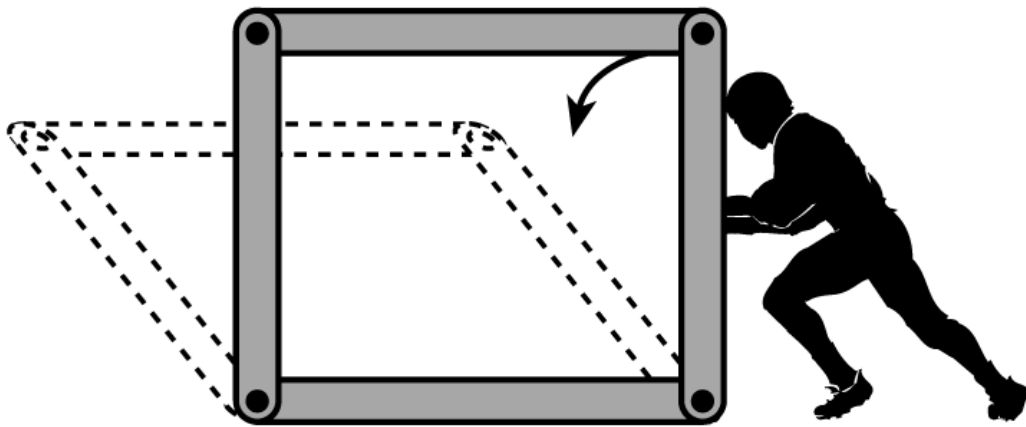


Figure 1.16

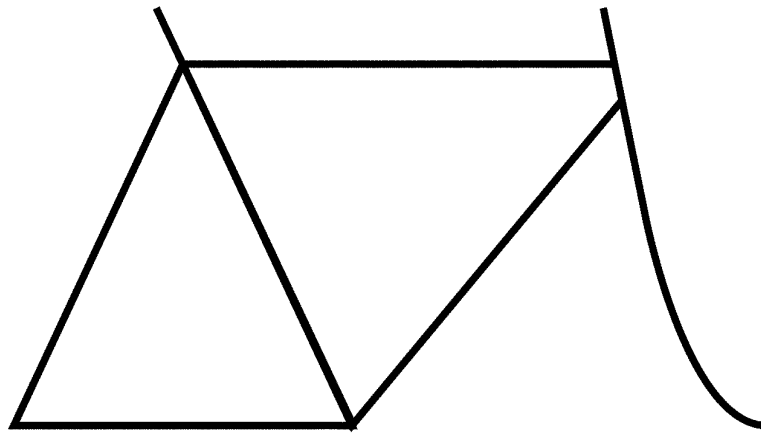


Figure 1.17

Assignment 1

- Take four 150 mm long cardboard strips. Form them into triangles, joining the ends together with split pins. Apply some pressure to your structure to test its strength. Now strengthen it by inserting supports.

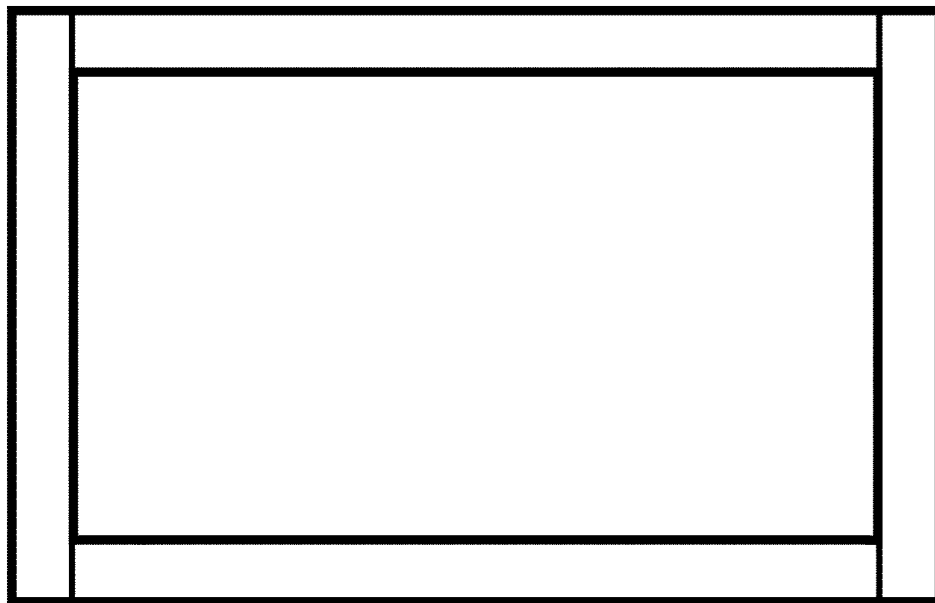


Figure 1.18

	LO 2.2			

Table 1.7

- This type of support or reinforcement is known as triangular trussing. It is particularly noticeable in bridges, cranes and roofs.

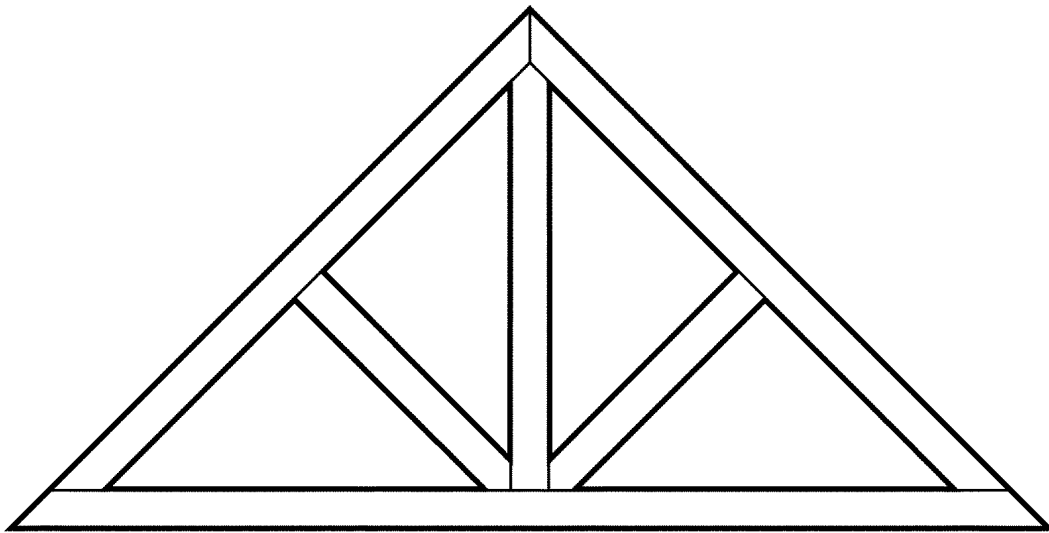


Figure 1.19

Assignment 2

1. The bookcase illustrated below needs reinforcement. Indicate where you would place a support/supports to strengthen the shelf.

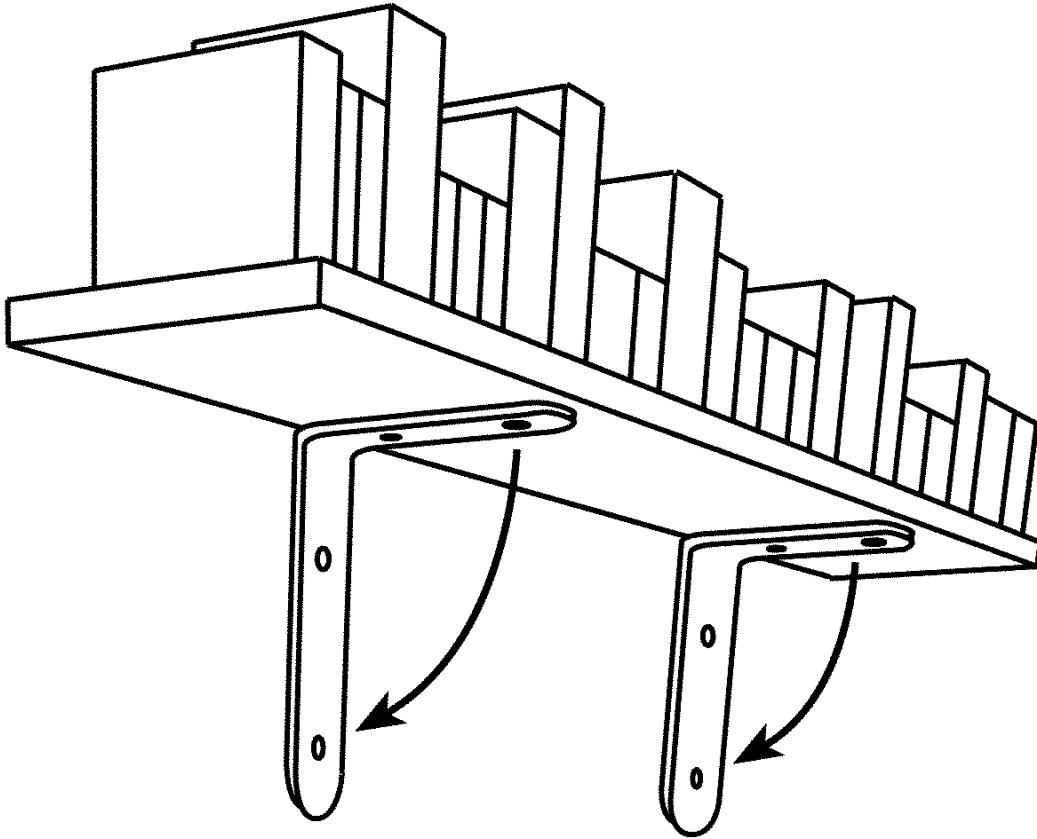


Figure 1.20

1. The legs of a trestle that supports a tabletop are held in place by means of a length of rope. Will this structure be able to withstand forces of stress or compression? Explain your answer and suggest a solution for the problem.

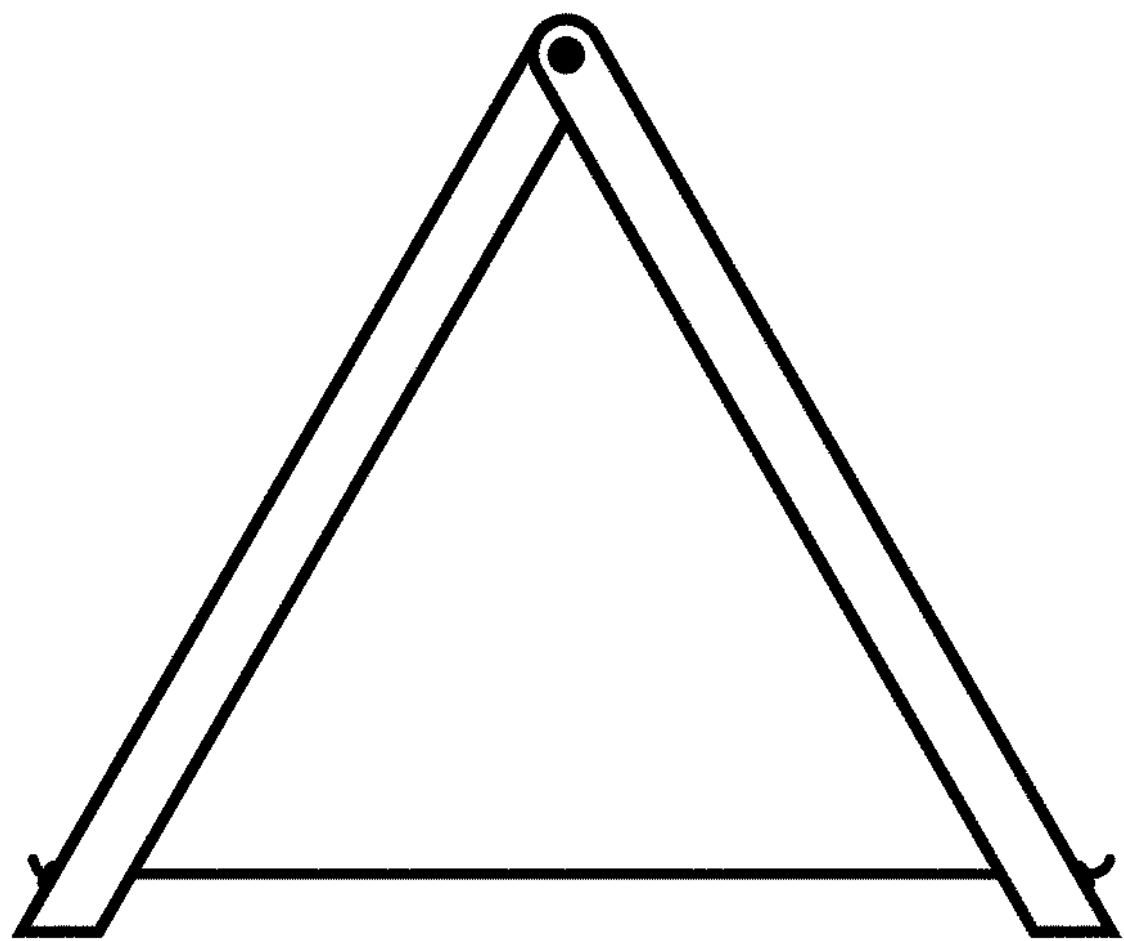


Figure 1.21

	LO 2.2			

Table 1.8

1.3.6 Assessment

LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
structures:2.1 demonstrate knowledge and understanding of frame structures:
<ul style="list-style-type: none"> • the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); • reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); • how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability);
processing:2.2 demonstrates a knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:
<ul style="list-style-type: none"> • to withstand forces (tension, compression, bending, torsion, shear); • to increase strengths or life-span; • how specific properties suitable for packaging can be achieved.

Table 1.9

1.3.7

1.3.8

1.3.9 Memorandum

ACTIVITY 1

Assignment 1

- **Square:** A triangle provides the strongest reinforcement; a single diagonal beam in one direction will be stronger than any other kind of reinforcement.
- **Triangle:** Which of the beams in the illustrated structure bears the most weight? Do all the beams bear equal weight? Let the learners decide. How could this be tested? Remove beams in turn and check whether the structure is weakened.
- Learners could also use pipe cleaners to represent a bicycle frame. Let the learners name further examples and allow class discussion.

Assignment 2

1. Which factors determine the strength of the strut? The thickness of the strut, the joins and the distance between the joins and the ends. Encourage the learners to list examples in common practice and discuss this.
2. The forces of both stress and compression. Force from above causes vertical compression (right down) and stress on the rope (horizontal) to keep the legs from shifting. If the force is not applied from above but from the side, one of the legs will be able to move. It can be rectified by replacing the rope with a solid bar.

3. Which factors determine the strength of the strut? The thickness of the strut, the joins and the distance between the joins and the ends. Encourage the learners to list examples in common practice and discuss this.
4. The forces of both stress and compression. Force from above causes vertical compression (right down) and stress on the rope (horizontal) to keep the legs from shifting. If the force is not applied from above but from the side, one of the legs will be able to move. It can be rectified by replacing the rope with a solid bar.

1.4 The basics of sketching⁴

1.4.1 TECHNOLOGY

1.4.2 Grade 8

1.4.3 STRUCTURES

1.4.4 Module 4

1.4.5 THE BASICS OF SKETCHING

Activity 1

The basics of sketching

Focus task 1

Although we quite readily use the excuse that we “cannot draw”, it is useful to remember that sketches were used in prehistoric times, even before people learnt how to write. It may be true that some people have greater artistic ability than others when it comes to drawing, but even the greatest artists did not just begin to make art. You are also able to develop your drawing skill and it is important to do this by practising methods that will help you to make good sketches. Bear in mind that sketches are free-hand drawings.

Some guidelines:

- Use a soft pencil, e.g. HB
- Grasp the pencil between your fingers, about 20 mm from its tip.
- Do not rest your hand on the paper while you draw (do free-hand drawing)
- Hold the pencil at an angle so that you are able to see its point.
- Be relaxed about what you are doing.

Try the following steps:

1. Draw a number of parallel lines, vertically, horizontally and diagonally. Try to focus on the point towards which you are drawing the lines, and keep your wrist from bending.

⁴This content is available online at <<http://cnx.org/content/m23744/1.1/>>.

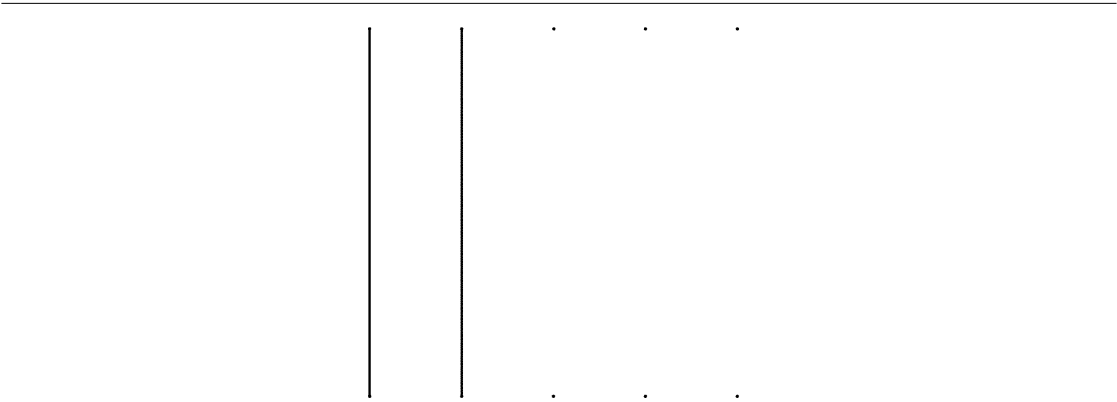


Figure 1.22

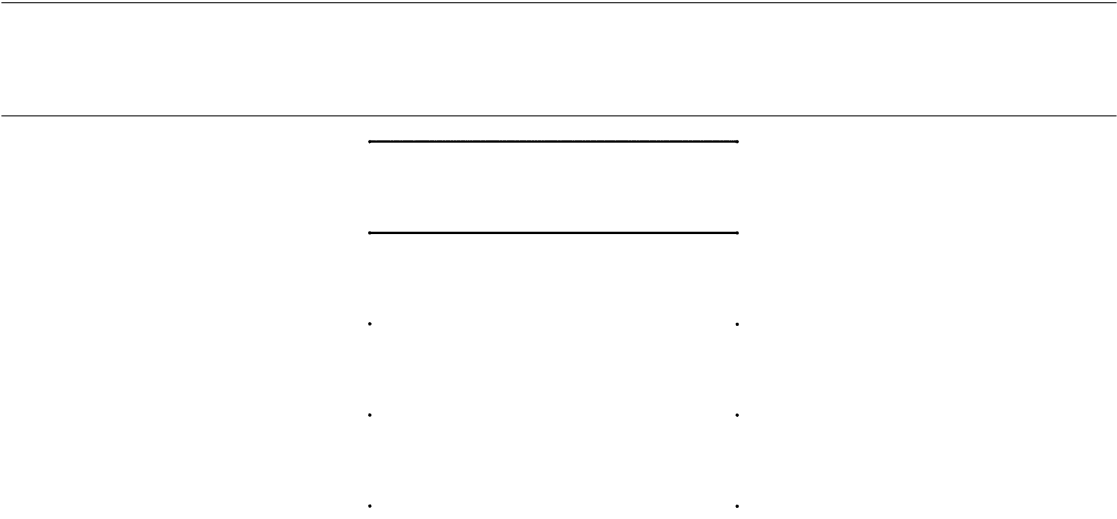


Figure 1.23

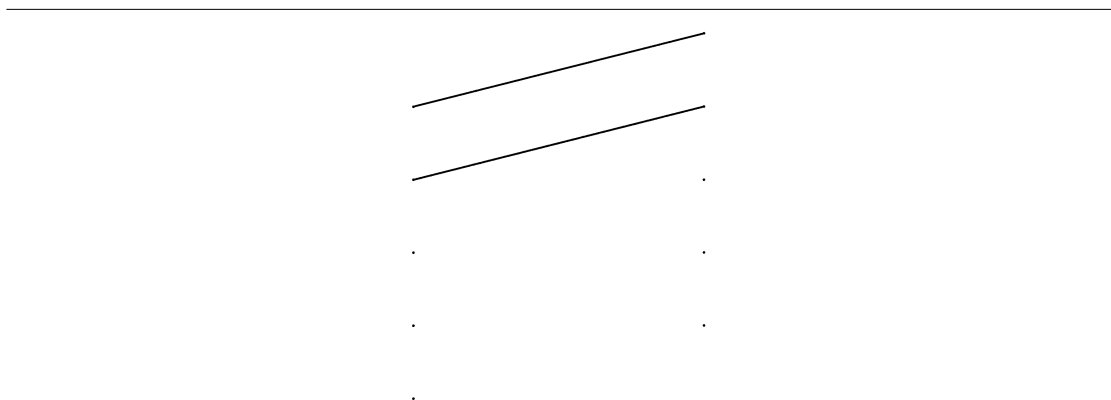


Figure 1.24

-
1. Once you feel at ease with drawing parallel lines, you may start drawing horizontal and vertical lines to form right angles (90 degree angles).

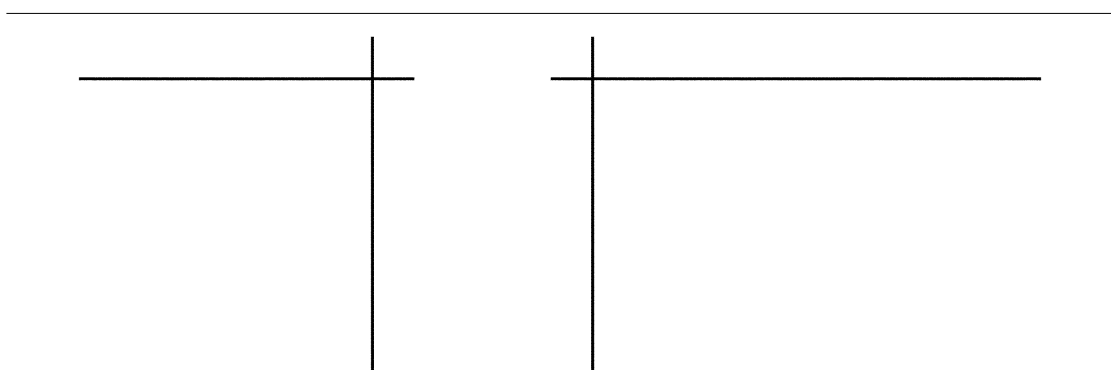


Figure 1.25

-
1. When you are able to draw these right angles confidently, you are ready for the next step: drawing squares. Squares and rectangles are commonly used to frame other objects that are sketched.

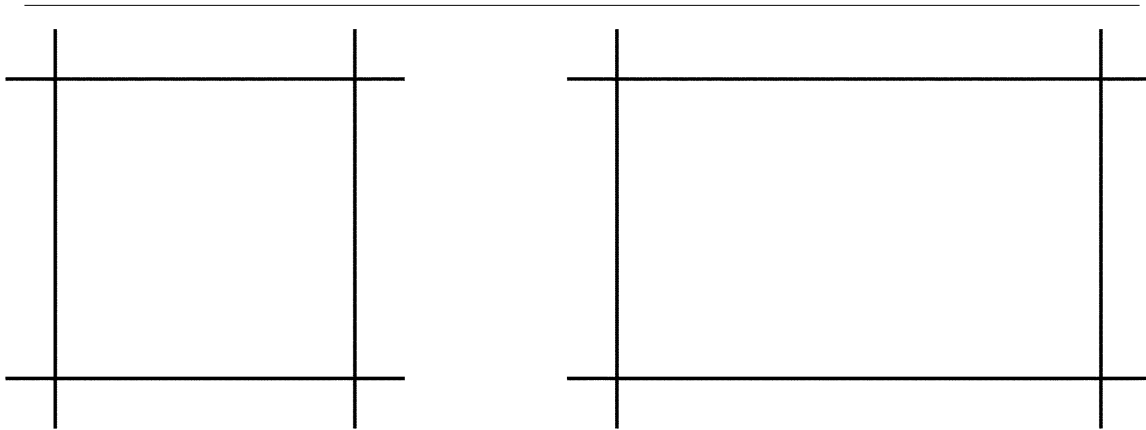


Figure 1.26

1. If you have to draw a circle, it may be useful to sketch a square – lightly. The sides should be equal to the diameter of the circle that is required. By marking the centres of the four sides you will identify the points of contact of the circle.

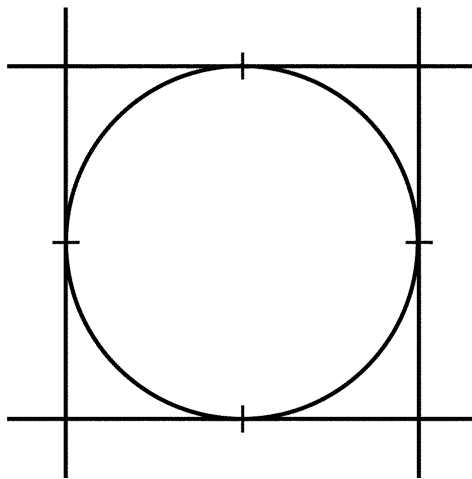


Figure 1.27

1. When you need to draw an elliptical shape, you may start by drawing a rectangle to guide you.

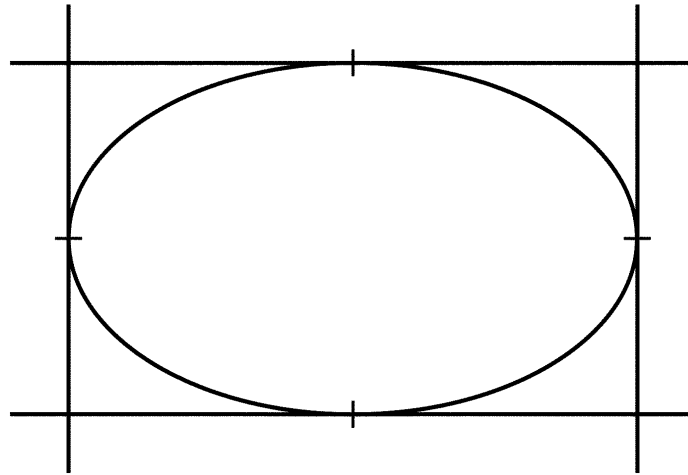


Figure 1.28

	LO 2.1			

Table 1.10

1.4.6 Assessment

LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
structures:2.1 demonstrate knowledge and understanding of frame structures:
<ul style="list-style-type: none"> the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability);
<i>continued on next page</i>

processing:2.2 demonstrates a knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:

- to withstand forces (tension, compression, bending, torsion, shear);
- to increase strengths or life-span;
- how specific properties suitable for packaging can be achieved.

Table 1.11

1.4.7 Memorandum

ACTIVITY 1

1. The learners must draw lines by linking dots. An additional suggestion: work from both dots for lines to meet in the middle (By doing this, it is less likely that the line will miss the dot).
2. and 3. Suggest that learners practise drawing straight freehand lines on loose sheets of paper.
4. and 5. Bear in mind that these are freehand sketches. Adequate opportunity for practising freehand drawing on loose paper is therefore important. Also encourage learners to practise in context, e.g. by drawing the wheels of a vehicle, etc.

1.4.8

1.5 Beams, pillars, struts, crossbars and anchoring lines⁵

1.5.1 TECHNOLOGY

1.5.2 Grade 8

1.5.3 STRUCTURES

1.5.4 Module 5

1.5.5 BEAMS, PILLARS, STRUTS, CROSSBARS AND ANCHORING LINES

Activity 1

Beams, pillars, supports/struts, crossbars and anchoring lines:

- The above are important parts of structures. They are used in buildings, bridges and other objects. The pipes forming the framework of your bicycle, for instance, belong to the category of beams.
- The main function of beams is to bear a load. If the load is too heavy, the beams will bend. In the past, tree trunks were used to provide solid beams, but the cost and weight of these have necessitated the development of different forms of structures, made from a variety of materials, used as beams.

⁵This content is available online at <<http://cnx.org/content/m23745/1.1/>>.

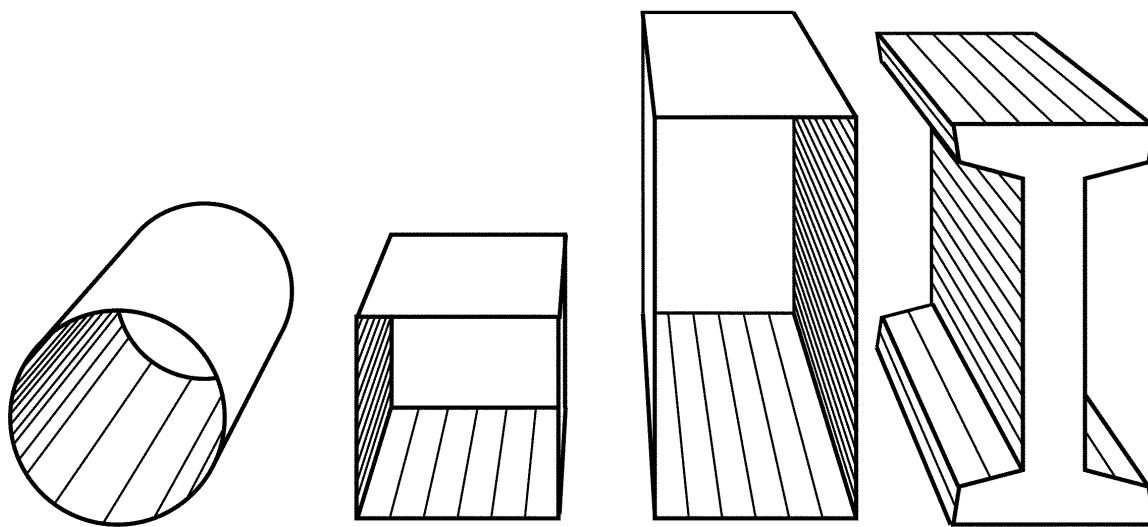


Figure 1.29

- Pillars and lampposts are beams that are used vertically. Pillars are useful in buildings for supporting overhanging verandas. If the pillars do not have the capacity to bear the load, the building will collapse. We now and again read about buildings, e.g. shopping centres that collapse.
- Brackets of some or other type are sometimes used to mount TV sets against walls. It will be clear to you that the TV set causes stress to the platform on which it rests, which actually can be classed as a beam. Being supported at one end only, such a beam is called a crossbeam. To keep the crossbeam in position, a strut is used as support.

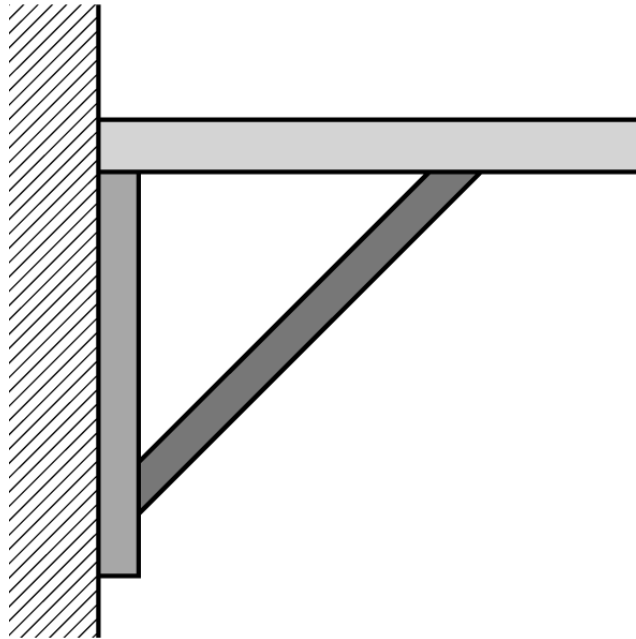


Figure 1.30

- Similar struts are used in tents and for power lines. In such cases, the struts may be cables and ropes.



Figure 1.31

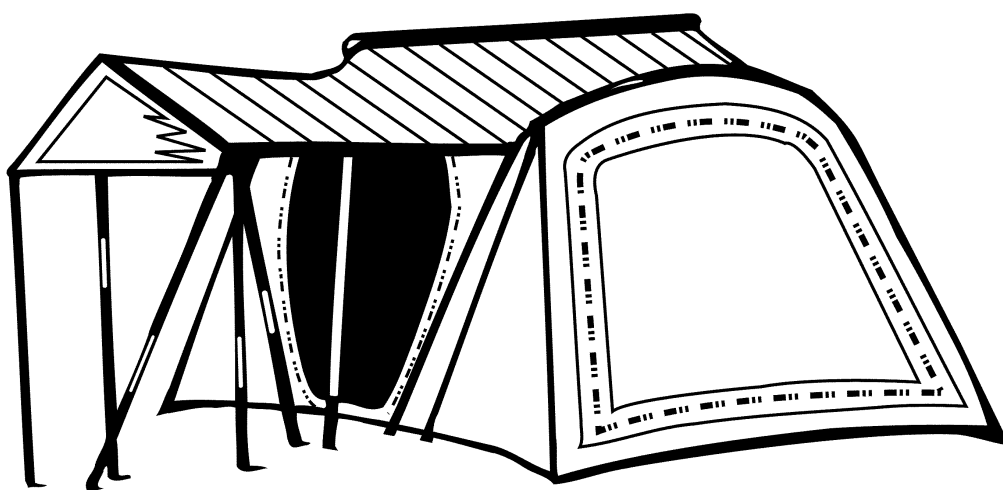


Figure 1.32

- This sketch shows how a learner reinforced his bridge (a beam) made of drinking straws, by means of a strut and string.

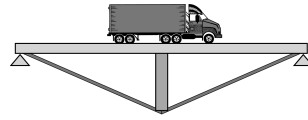


Figure 1.33

Assignment 1

- Examine the following illustrations and describe the ways in which technology was used to solve problems occurring in different cultures.



Figure 1.34

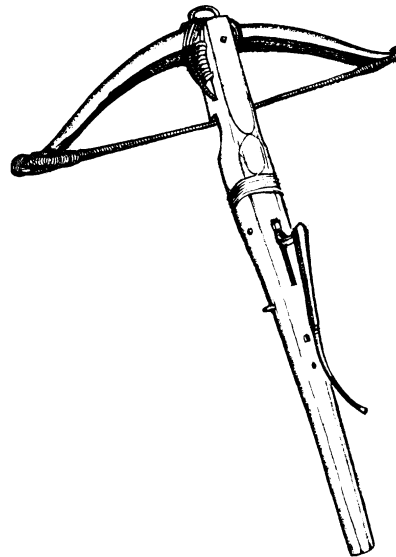


Figure 1.35

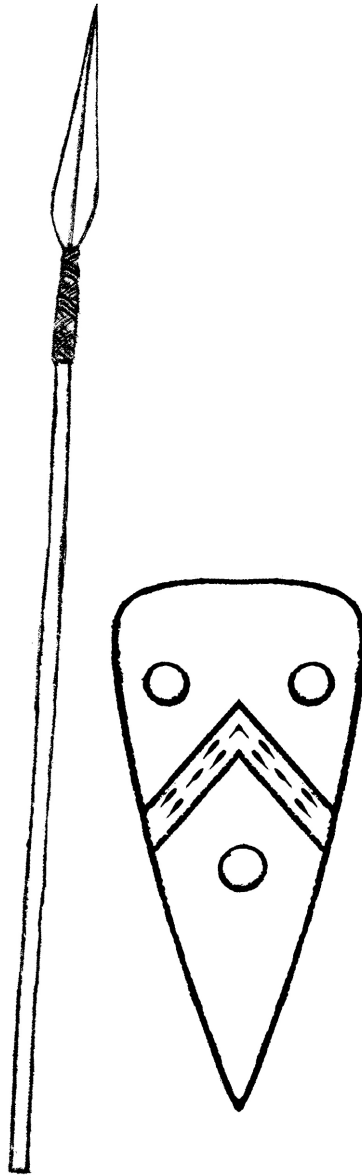


Figure 1.36

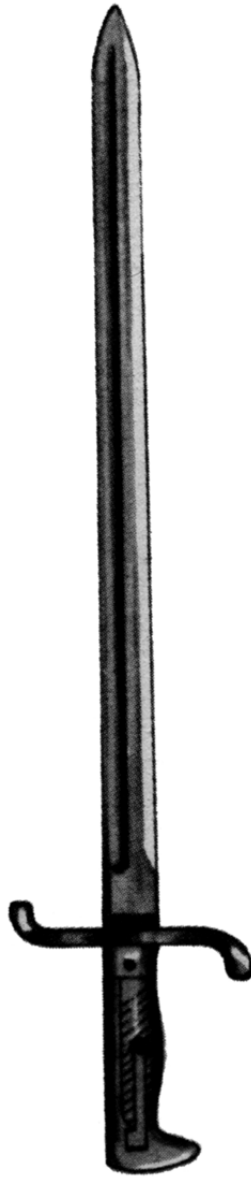


Figure 1.37

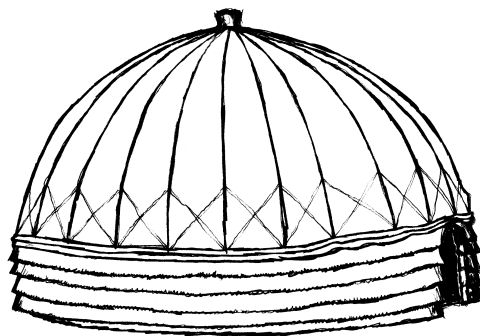


Figure 1.38

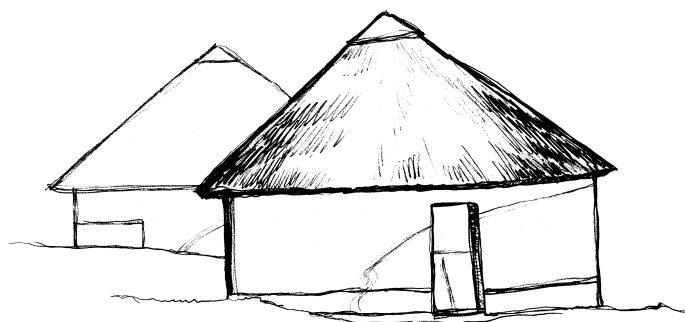


Figure 1.39

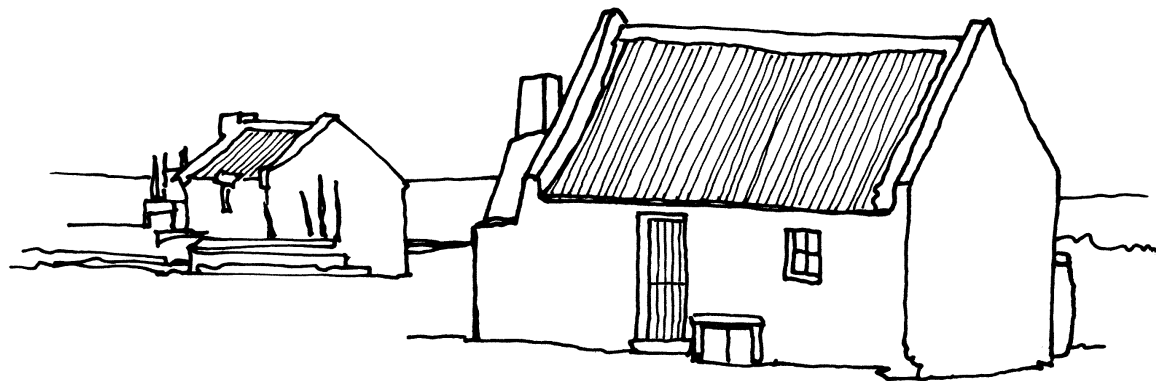


Figure 1.40

Assignment 2

- Refer to the following and describe the impact that technological development with regard to structures has had on the lifestyle of people.
- Skyscrapers
- Aeroplanes
- Roof trusses
- Railway lines and trains
- Bridges

	LO 3.2			

Table 1.12

1.5.6 Assessment

LO 3
TECHNOLOGY, SOCIETY AND THE ENVIRONMENT The learner will be able to demonstrate an understanding of the interrelationships between science, technology and the environment.
This is demonstrated when the learner:
indigenous Technology and Culture:3.1 compares how different cultures have solved similar problems and relates the differences to the culture and values of their societies;
impact of Technology:3.2 expresses and details opinions about the positive and negative impacts of products of Technology on the quality of people's lives and the environment in which they live.

Table 1.13

1.5.7 Memorandum

ACTIVITY 1

Allow learners to discuss beams, pillars, struts, crossbeams and anchor lines and to list examples. Let them explain where the stresses are exerted and what the application of a specific structure is, why it is suitable for the application and how it could be improved. In the case of a crossbar, the stress, for instance, is exerted below; a pillar bears vertical stress that is equally strong all over.

Assignment 1

- It is important to use correct terminology when discussing examples:
- **Bow and arrow:** Problem: It was necessary to hunt to get food. Animals could not be caught by hand. It became necessary to design a weapon. The bow and arrow as a structure: The string is used to exert the force of stress on the bow. The bending of the bow makes it possible to transfer this force to the arrow as the force of compression. The arrow, as a beam, causes the force to work in the direction of the arrow point to penetrate the prey.
- Crossbow Like the bow and arrow, but more accurate and more powerful.
- Shield and spear The spear serves as a beam, which means that the force is exerted in the direction of the point, which can therefore penetrate the prey. The shield forms a shell structure, with the skin as shell and the wood as a frame.
- Sword The blade works as a beam.
- Ordinary hut A shell structure, with the woodwork as frame and the grass as shell.
- Rondavel and thatch-roofed houses Like ordinary huts, but with the clay forming part of the shell.

Assignment 2

- **Skyscrapers:** larger numbers of people are able to inhabit a specific space. This facilitates urbanisation and makes demands on urban transport, sewerage, electricity supply, removal of storm water: problems that had to be solved by means of technology and have created job opportunities, which lead to further urbanisation.

- **Aeroplanes:** great distances can be covered in brief periods of time, which means that both people and goods can be transported quickly. This, however, has implications with regard to pollution and the utilisation of natural resources. It also increases the tempo of living.
- **Roof trusses:** For people who live in inhospitable climatic regions, roof trusses prevent roofs from collapsing when there are heavy snowfalls and hail.
- **Railway lines and trains:** As with aeroplanes, but trains have also enabled people to spread civilisation across the globe.
- **Bridges:** as with aeroplanes and trains.

1.6 The technological process⁶

1.6.1 TECHNOLOGY

1.6.2 Grade 8

1.6.3 STRUCTURES

1.6.4 Module 6

1.6.5 THE TECHNOLOGICAL PROCESS

Activity 1

The Technological Process

- Assemble your own portfolio of work and incorporate this module in it. Do all additional work for this module on A4-size paper and store it in a ‘flip file’ as you proceed. Consider designing an interesting and relevant cover page to illustrate what you understand technology to be.

The first challenge!

- Because of issues related to safety, wide, open parkland and playing fields have lost some of their attractiveness in our country. Young children, however, still need things to satisfy the need for adventure that is met by climbing. Designers have produced climbing frames that can be installed in backyards for this purpose. You are invited to design and build such a framework for climbing.

Your design proposition

- Identify the key words in the above paragraph. Then write a proposal containing these key words. Remember that a proposal for a design comprises a sentence or two that state exactly what you plan to do. The proposal would normally begin with: *Design and manufacture of a ...*

	LO 1.5			

⁶This content is available online at <<http://cnx.org/content/m23747/1.1/>>.

Table 1.14

Specifications

- The specifications that follow below will be relevant to your design: You could add your own specifications – perhaps with some help from your educator!
- Climbing frames must be functional
- They must be safe
- Wood or drinking straws can be used to construct the model (ice-cream sticks can be used effectively)
- The model must not be larger than A4-size paper (length, height and width designed to scale)
- It must be affordable (do not plan to use an unnecessarily large quantity of materials)

	LO 1.6			

Table 1.15

Research

- You have to obtain information regarding the following:
- Various designs for climbing frames;
- Various methods of construction using sticks made from wood;
- The types of glue to use for wood and for drinking straws;
- What you could use to make a swing;
- The tools that you will need, and the purpose of each tool.

	LO 1.1						LO 1.4			

Table 1.16

Some ideas to help you with your construction:

1. Use cardboard triangles to steady your framework

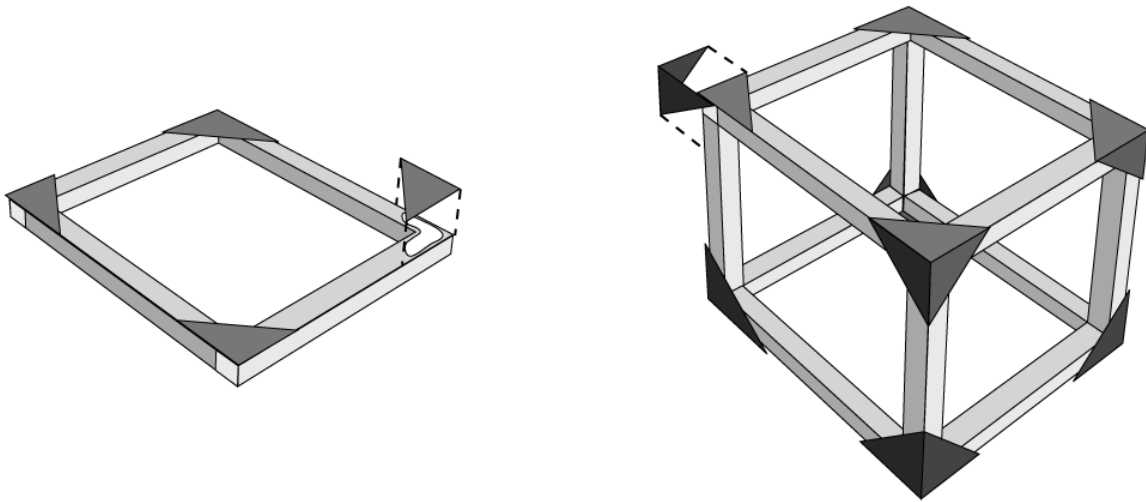


Figure 1.41

1. Use pipe cleaners in conjunction with drinking straws

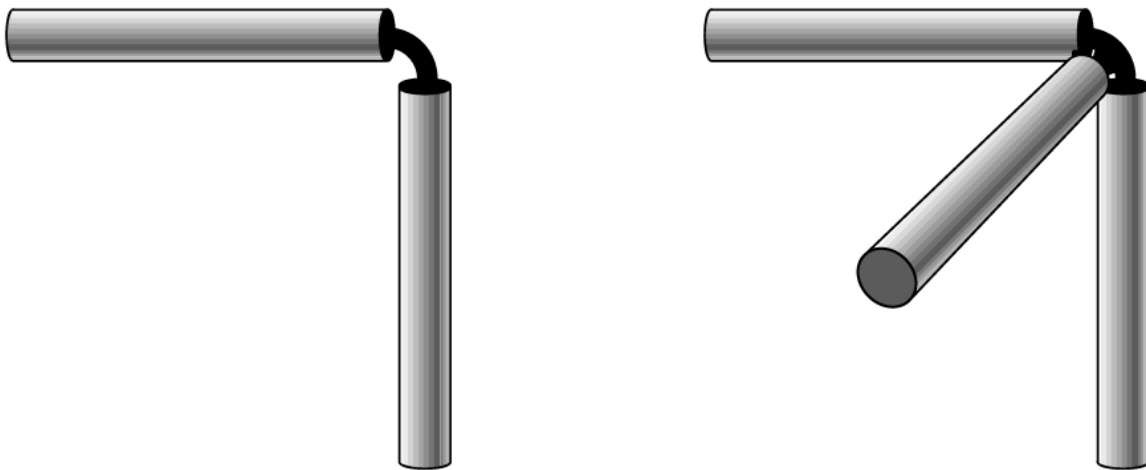


Figure 1.42

1. Use simple joins if you make use of wood

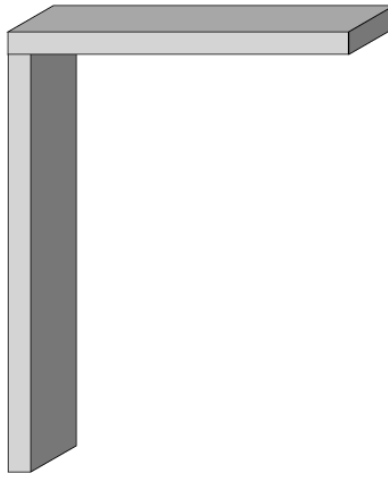


Figure 1.43

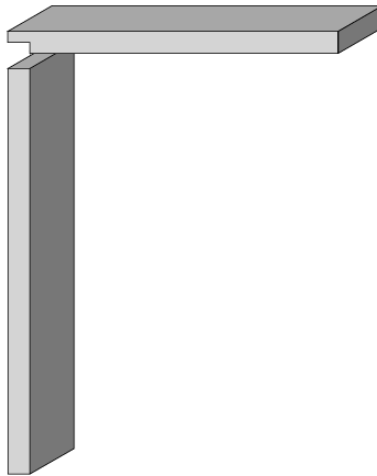


Figure 1.44

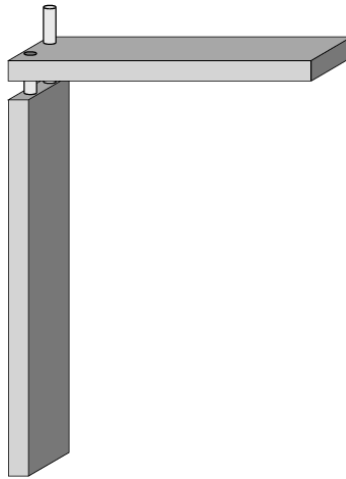


Figure 1.45

- **Ideas:** Jot down any ideas that you might like to develop. You will note that the examples were drawn 3D. Go to Focus Task 2 to find out how to draw an isometric drawing.

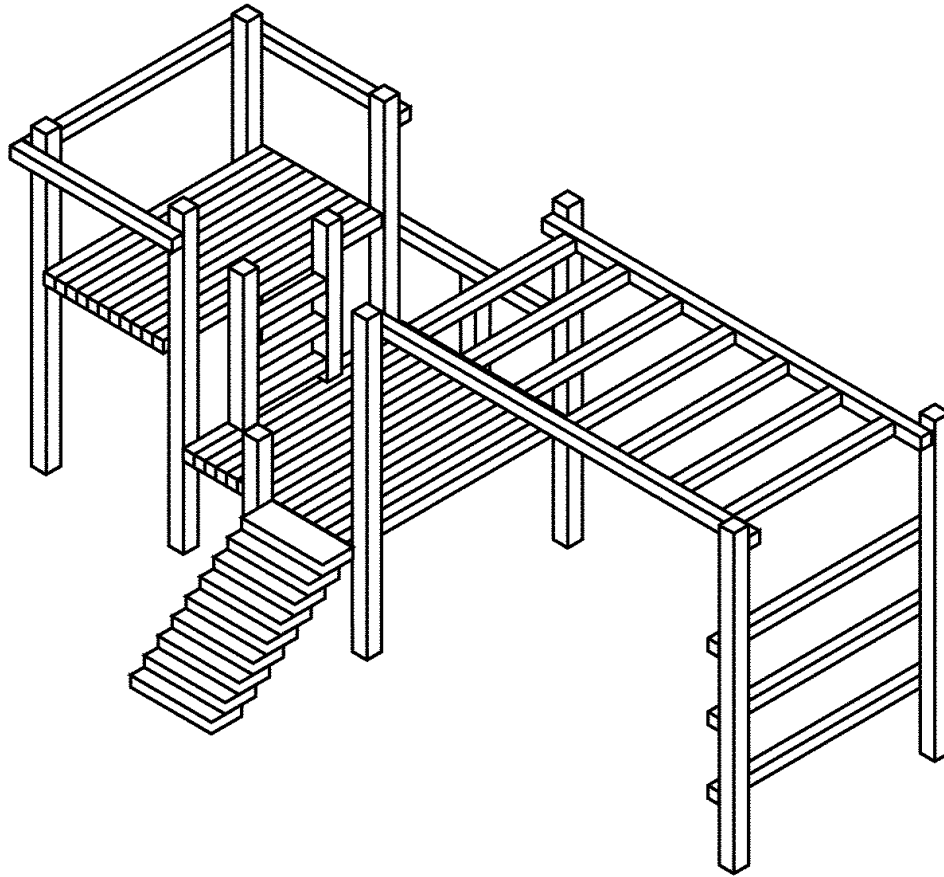


Figure 1.46

	LO 1.7			

Table 1.17

Manufacturing:

- This step must be planned thoroughly and your planning for it must be presented in your portfolio. Read through the section dealing with safety precautions in the workshop before you commence working. You must be sure of what you need with regard to the following before you start work on your construction:
- The materials with which you will be working – ice-cream sticks or modelling straws will work well;
- Your final design;

- A list of things that need to be sawn, with correct measurements and number of parts;
 - A written plan of the steps you will follow during construction, showing the correct order;
 - Bear in mind that your portfolio will have to contain a report on the construction process.
-
- Also remember that you cannot rely on everything going according to plan – you may have to make adjustments to your original ideas.

	LO 1.9					LO 1.10			

Table 1.18

Evaluation:

- Each new Mercedes Benz that is manufactured undergoes a thorough test for evaluation. This is important because it provides feedback to the manufacturers who need to know what they should do to improve subsequent models. You should also ask yourself questions about whether your model meets the stipulations of your specification. You will also benefit by getting the opinion of other people. Be honest with yourself and allow yourself to be critical about your design model. Ask yourself how you would approach the project if you had to repeat it.

	LO 1.13			

Table 1.19

1.6.6 Assessment

Learning Outcomes(LOs)	
LO 1	
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.	
<i>continued on next page</i>	

This is demonstrated when the learner:	
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;	
1.3 develops and performs practical tests in the technological areas (Structures, Processing, and Systems and Control);	
1.4 uses appropriate technologies and methods to:	
<ul style="list-style-type: none"> • collect relevant data from different sources and resources; • extract relevant data; • make meaningful summaries;use information to justify and support decisions and ideas; 	
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;	
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below:	
<ul style="list-style-type: none"> • people: age target market; • purpose: function; • appearance: colour, shape; • environment: where will product be used; • safety: for users; • cost: cost of materials; 	
<i>continued on next page</i>	

1.7 generates several alternative solutions and writes notes, ideas that show some links to the design brief and specifications;	
makes:1.9 develops a plan for making that outlines all of the following:	
<ul style="list-style-type: none"> resources needed; sketches showing the necessary dimensions or quantities; all steps necessary to making the product; 	
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;	
evaluates: 1.13 tests and evaluates the products or systems with objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications;	
communicates: 1.15 presents ideas using two-dimensional or three dimensional sketches, circuit diagrams or systems diagrams that include all of the following features:	
<ul style="list-style-type: none"> use of SA drawing conventions (e.g. dimension lines, labelling, line types, symbols); notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings. 	

Table 1.20

1.6.7

1.6.8 Memorandum

ACTIVITY 1

- Refer to the framework included in the module for the assessment of the work. You could extend the framework to meet all possible portfolio requirements, e.g. by ordering research results by means of tables and by means of graphic presentations.

1.7 Isometric drawing⁷

1.7.1 TECHNOLOGY

1.7.2 Grade 8

1.7.3 STRUCTURES

1.7.4 Module 7

1.7.5 ISOMETRIC DRAWING

Activity 1

Isometric drawing

Focus task 1

- With this method of drawing, the object of the drawing is shown at right angles, viewed as from the front, and lines that represent the sides of the object drawn at a 45 degree angle to the left or the right.

How to do an isometric drawing:

1. Draw the front view of the object:

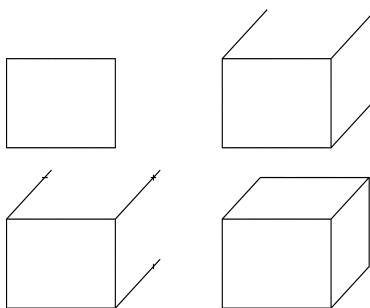


Figure 1.47

1. Draw feint construction lines at a 45 degree angle to the left or to the right to suggest depth:

⁷This content is available online at <<http://cnx.org/content/m23748/1.1/>>.

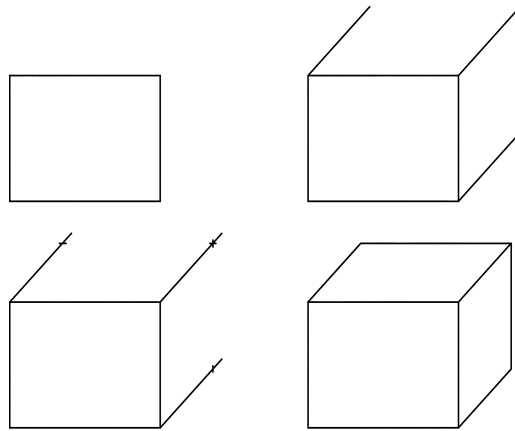


Figure 1.48

1. Indicate the depth on the lines representing depth:

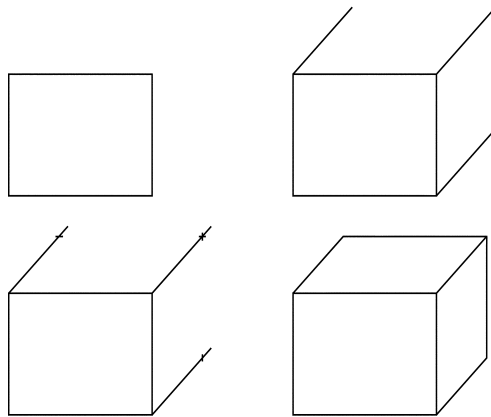


Figure 1.49

1. Complete the drawing:

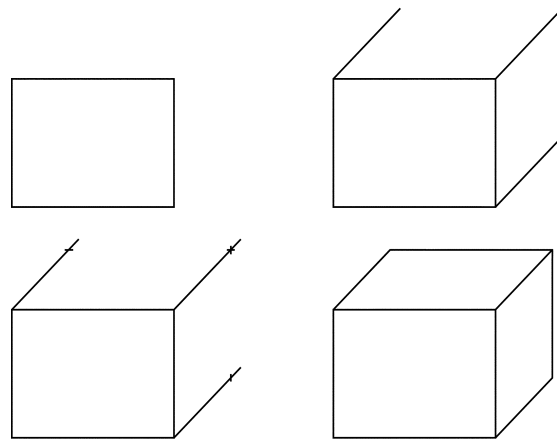


Figure 1.50

	LO 2.1			

Table 1.21

Activity 2

Safety precautions in the classroom:

- Rules for safety are the most important aspect of any workshop. You must be thoroughly acquainted with the rules and safety measures that apply in your workshop. Ensure that you know what safety procedures have to be followed in case of an accident. Each learner must also know where the emergency switch and the first aid kit are located. Report every accident to your educator.

Note the following:

1. Clothing:

- Wear an apron or overall;
- Wear shoes;
- Tuck in ties and jewellery so that these items will not get in the way;
- Roll up long sleeves and tie hair to keep it out of the way.
- Behaviour:
- A workshop is no place for games;
- Do not run in a workshop;
- Never use a workshop on your own or without permission.
- Working safely:

- Use tools for the purpose for which they were designed;
- Put every tool away in the allocated place when you have finished using it;
- When carrying sharp-edged or pointed tools, hold them in such a way that the dangerous points or edges point towards the floor;
- Follow the instructions provided on machines;
- Wear safety goggles when working on machines;
- Report any faulty machines;
- See to it that machines are left in proper order when you finish working on them.

Safety measures for working with electricity follow in the module on electronics!

Assignment 1

- Make a list of dangerous situations that can possibly occur in a workshop:

1.7.6 Assessment

Learning Outcomes(LOs)
LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.3 develops and performs practical tests in the technological areas (Structures, Processing, and Systems and Control);
1.4 uses appropriate technologies and methods to:
<ul style="list-style-type: none"> • collect relevant data from different sources and resources; • extract relevant data; • make meaningful summaries;use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below:
<i>continued on next page</i>

<ul style="list-style-type: none"> • people: age target market; • purpose: function; • appearance: colour, shape; • environment: where will product be used; • safety: for users; • cost: cost of materials;
1.7 generates several alternative solutions and writes notes, ideas that show some links to the design brief and specifications;
makes:1.9 develops a plan for making that outlines all of the following:
<ul style="list-style-type: none"> • resources needed; • sketches showing the necessary dimensions or quantities; • all steps necessary to making the product;
LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
structures:2.1 demonstrate knowledge and understanding of frame structures:
<ul style="list-style-type: none"> • the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); • reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); • how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability);
processing:2.2 demonstrates a knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:
<ul style="list-style-type: none"> • to withstand forces (tension, compression, bending, torsion, shear); • to increase strengths or life-span; • how specific properties suitable for packaging can be achieved.

Table 1.22

1.7.7 Memorandum

ACTIVITY 7

- Ensure that the learners are given sufficient opportunity to master this important drawing skill. Neatness is particularly important and the use of light construction lines and basic sketching skills (Activity 4) will enable the learner to meet these requirements.

Chapter 2

Term 2

2.1 Food processing and utensils¹

2.1.1 TECHNOLOGY

2.1.2 Grade 8

2.1.3 STRUCTURES

2.1.4 Module 8

2.1.5 FOOD PROCESSING AND UTENSILS

Food Processing

ACTIVITY 1:

To be able to describe the term *processing* in terms of the technological process.

Introduction

The term *processing* covers a wide area. It has to do with the processing of materials and/or products into another final form or product. It entails the processing of anything, e.g. the processing of wheat into flour and then into bread, the processing of wood into furniture and the processing of material into clothing. In this module we will focus on food. In grade 9 we will focus on resistant materials (wood, metal, plastic and paper).

You will have the opportunity to plan and construct a food stall for the coming World Fair. The stall must represent a specific country and produce and sell the fast foods of that country. Before you can start, it is important that you obtain more information about kitchen utensils, safety, hygiene, first aid, measurement and the various food groups.

1.1 Define the term *processing*.

1.2 Give two examples of processing done in your town/area and give a brief description of each.

1.3 Use one of the examples in 1.2 and now describe the term *processing* in terms of the technological process. Use the terms *design, make*

	LO 1.5						LO 2.2			

Table 2.1

¹This content is available online at <<http://cnx.org/content/m23749/1.1/>>.

ACTIVITY 2:

To be able to describe the utensils generally used in food processing, as well as the function of each.

- During the processing of food you will require a variety of utensils. It is important for you to know what these are and how to use them with confidence for the right purpose.
- Utensils can be divided into five main groups according to the function they perform. These main groups are:
 - Measuring utensils
 - Mixing utensils
 - Cooking utensils
 - Baking and frying utensils
- VariousWrite down the name of the utensils which belong to each of the following five groups. Also write down the function of each utensil.
- Group: MEASURING UTENSILS
- Group: MIXING UTENSILS
- Group: COOKING UTENSILS
- Group: BAKING AND FRYING UTENSILS
- Group: VARIOUS

	LO 1.10			

Table 2.2

2.1.6 Assessment

Learning Outcomes(LOs)	
LO 1	
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.	
<i>continued on next page</i>	

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designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;	
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<i>continued on next page</i>	

1.7 generates several alternative solutions and writes notes, ideas that show some links to the design brief and specifications;	
makes:1.9 develops a plan for making that outlines all of the following:	
<ul style="list-style-type: none"> resources needed; sketches showing the necessary dimensions or quantities; all steps necessary to making the product; 	
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;	
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;	
evaluates: 1.13 tests and evaluates the products or systems with objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications;	
communicates: 1.15 presents ideas using two-dimensional or three dimensional sketches, circuit diagrams or systems diagrams that include all of the following features: <ul style="list-style-type: none"> use of SA drawing conventions (e.g. dimension lines, labelling, line types, symbols); notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings. 	
LO 2	
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.	
This is demonstrated when the learner:	
structures:2.1 demonstrate knowledge and understanding of frame structures:	
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<i>continued on next page</i>	

processing:2.2 demonstrates a knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:

- to withstand forces (tension, compression, bending, torsion, shear);
- to increase strengths or life-span;
- how specific properties suitable for packaging can be achieved.

Table 2.3

2.1.7

2.1.8

2.1.9 Memorandum

ACTIVITY 1

Introduction:

- The module deals with food processing. Seeing that only a few schools have the necessary facilities to cook food, a fast-food dish has been chosen as learners can prepare it at home and put it together in the classroom. It would be very helpful if a microwave oven were available during the production process. Learners must be encouraged to develop sound business principles during the course of this module. It is for this reason that entrepreneurship is emphasized. The module could also be linked to possible market days.

1.1 Processing can involve any material or product that undergoes a process in order to form a new product. That entails the processing, combining, colouring, packaging, etc. of materials and products.

1.2 Any example that is distinctive of your environment, e.g. grapes to wine, wheat to bread, etc. can be used.

ACTIVITY 2

- Use the pictures for this activity. The pictures have been jumbled and must be organized in the tables that follow them, as indicated in this memorandum.
- The function of each piece of equipment must also be written down.

Group 1: Measuring Utensils

Utensil(s)	Function
1. Measuring spoons	To measure small amounts of liquids or dry ingredients.
2. Measuring cup	To measure small amounts of dry ingredients.
3. Measuring jug	To measure liquids and dry ingredients.
4. Scales	To measure dry and solid ingredients.

Table 2.4

Group 2: Mixing Utensils

1. Mixing-bowl	To mix cake mixtures and mixtures for scones, bread or biscuits.
2. Wooden spoon	To stir or beat starch or milk mixtures; to rub ingredients through a sieve.
3. Spatula	To fold stiffly beaten egg whites into a mixture; to apply icing; to turn flapjacks.
4. Dough scraper	To scrape mixtures out of bowls, dishes and saucepans so that there is no wastage; to scrape leftovers out of plates and dishes before washing the dishes.
5. Balloon whisk	To beat (whisk) eggs and other liquid mixtures.

Table 2.5

Group 3: Cooking Utensils

1. Saucepan	To cook, steam or simmer food; to make sauces or gravies; to cook jam.
2. Double boiler	To cook food by steaming it, e.g. egg custard, rice or fish.

Table 2.6

Group 4: Baking- and Grilling Utensils

1. Baking tray	To bake scones and biscuits.
2. Bread and cake tins	To bake cakes and bread.

Table 2.7

Group 5: Sundries

1. Sieve	To sieve flour and dry ingredients.
2. Colander	To drain rice and vegetables, to wash lettuce and other vegetables.
3. Grater	To grate vegetables, cheese, nuts, orange peel.
4. Kettle	To boil water.

Table 2.8

2.1.10

2.2 Rules regarding hygiene²

2.2.1 TECHNOLOGY

2.2.2 Grade 8

2.2.3 STRUCTURES

2.2.4 Module 9

2.2.5 RULES REGARDING HYGIENE

ACTIVITY 1:

To be able to name and apply the rules regarding hygiene.

- Bacteria cause food decay, which can result in food infection or food poisoning. It is essential for food to be protected against harmful bacteria. In order to do so, a few basic rules must be applied in the kitchen and also with regard to personal hygiene.
- The drawings that follow illustrate aspects of hygiene in the kitchen, as well as personal hygiene.
- Write down a rule of hygiene deduced from each picture.



Figure 2.1



Figure 2.2



Figure 2.3

²This content is available online at <<http://cnx.org/content/m23750/1.1/>>.



Figure 2.4



Figure 2.5



Figure 2.6



Figure 2.7



Figure 2.8



Figure 2.9



Figure 2.10



Figure 2.11



Figure 2.12



Figure 2.13



Figure 2.14

2.2.6 Assessment

Learning Outcomes(LOs)
<i>continued on next page</i>

LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.3 develops and performs practical tests in the technological areas (Structures, Processing, and Systems and Control);
1.4 uses appropriate technologies and methods to:
<ul style="list-style-type: none"> • collect relevant data from different sources and resources; • extract relevant data; • make meaningful summaries;use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below:
<ul style="list-style-type: none"> • people: age target market; • purpose: function; • appearance: colour, shape; • environment: where will product be used; • safety: for users; • cost: cost of materials;
1.7 generates several alternative solutions and writes notes, ideas that show some links to the design brief and specifications;

Table 2.9

<p>makes:1.9 develops a plan for making that outlines all of the following:</p> <ul style="list-style-type: none"> • resources needed; • sketches showing the necessary dimensions or quantities; • all steps necessary to making the product (makes);
<i>continued on next page</i>

1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;
evaluates:1.13 tests and evaluates the products or systems with objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications;
communicates:1.15 presents ideas using two-dimensional or three dimensional sketches, circuit diagrams or systems diagrams that include all of the following features: <ul style="list-style-type: none"> • use of SA drawing conventions (e.g. dimension lines, labelling, line types, symbols); • notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings.

Table 2.10

2.2.7 Memorandum

ACTIVITY 1

- Allow learners to write down their own rules, present them to the class and then respond to the reactions from the class.

2.3 Safety and first aid in the kitchen³

2.3.1 TECHNOLOGY

2.3.2 Grade 8

2.3.3 FOOD PROCESSING

2.3.4 Module 10

2.3.5 SAFETY AND FIRST AID IN THE KITCHEN

ACTIVITY 1:

To be able to name and apply the rules regarding safety in the kitchen.

- There are a number of dangers in the kitchen. There are various places and utensils that can cause injuries if not used with the necessary care. It is extremely important that rules regarding safety in the kitchen be followed. These include, for example, that stoves should be used correctly and that safety rules regarding electricity be applied.

4.1 Give ten general rules for safety in the kitchen.

4.2 Give three safety measures for when you use a stove.

4.3 Give three safety aspects regarding electricity in the kitchen.

³This content is available online at <<http://cnx.org/content/m23751/1.1/>>.

	LO 1.12			

Table 2.11**ACTIVITY 2:**

To be able to describe and apply basic first aid.

- First aid is the immediate treatment of an injured or ill person by means of the aids available. Today, restaurant and hotel staff are required to undergo first-aid training. It is also important that there is a first-aid kit in the kitchen. Quick and effective treatment can promote rapid recovery, prevent the condition of the injured person from deteriorating and can, in some cases, even save lives.

- There are two incidents that occur regularly in the kitchen: cuts and burns.

5.1 Name two ways in which blood loss can be slowed down in the case of a cut.

5.2 Name two types of burns and describe how you would treat each one.

5.3 Name three precautions that can be taken to prevent burns and scalding in the kitchen.

5.4 Study the picture below and identify all the possible risks to hygiene and safety. Also give recommendations on how these risks could be prevented.

**Figure 2.15**

	LO 1.12			

Table 2.12**2.3.6 Assessment**

Learning Outcomes(LOs)
LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
This is demonstrated when the learner:
<p>makes:1.9 develops a plan for making that outlines all of the following:</p> <ul style="list-style-type: none"> • resources needed; • sketches showing the necessary dimensions or quantities; • all steps necessary to making the product (makes);
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;

Table 2.13

2.3.7 Memorandum

ACTIVITY 1

1.

- Keep sharp knives out of children's reach.
- Cut away from yourself when using a chopping-board.
- Do not allow pets in the kitchen.
- Keep curtains away from the stove.
- Do not wear garments with long or wide sleeves when you work at the stove.
- Mark containers that contain foodstuffs and cleaning agents clearly.
- Mark poisons clearly and keep them out of reach of children.
- Roll broken glass in layers of newspaper before placing it in a rubbish bin.
- When passing a knife to someone, present it with the handle pointing towards the recipient.
- Do not run and play in a kitchen.

2.

- Turn pot or pan handles away from the edge of the stove.
- Do not leave the kitchen while there is hot oil on the stove.
- Use dry potholders, not wet cloths.
- If oil should start burning, place a lid on the container; do not pour water on oil.
- Lift the lid of a pot in such a manner that the steam escapes away from you.

3 .

- Do not use damaged electrical cords.
- Turn power off after use.
- Do not handle appliances with wet hands.
- Keep electrical cords away from hot appliances.

Table 2.14**ACTIVITY 2:****Situation**

A unique opportunity has arisen for all small businesses interested in erecting a stall at the coming World Fast Food Fair. Every stall will be expected to produce tasty fast food representing a specific country. Your educator will divide you into groups and give you the opportunity to draw the name of a specific country to represent.

Specifications

Each stallholder will be expected to produce the fast-food meal in front of a panel of judges. The panel will look at the following points:

- The fast food meal and stall must represent the chosen country.
 - The food must have a high nutritional value.
 - The food must be produced by means of a production line system (as in bulk).
 - The food must be packaged attractively.
 - Health and safety rules must be observed.
 - Preparation time may not be more than eight minutes.
1. Work in groups of two or three and make preparations to form a company, think up a name and design a logo for the company.
 2. Compare the staple food and fast foods of two countries/cultures.

	LO 3.1			

Table 2.15**3. Research**

Now do in-depth research on the food of your specific country, on fast foods in general and on health and safety in fast-food outlets.

	LO 1.1						LO 1.4			

Table 2.16**4. Ideas**

Use the information you collected during your research and generate three ideas for your fast food meal. Bear the following in mind:

- The availability of ingredients
 - Presentation - packaging of the end-product
 - Production process
 - Preparation time
-
- Each idea must contain the name, a drawing and a description of the fast food.
 - Now choose a final idea and make an attractive colour drawing of your product.

	LO 1.13			

Table 2.20

2.4.6 Assessment

Learning Outcomes(LOs)
LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.3 develops and performs practical tests in the technological areas (Structures, Processing, and Systems and Control);
1.4 uses appropriate technologies and methods to:
<ul style="list-style-type: none"> • collect relevant data from different sources and resources; • extract relevant data; • make meaningful summaries;use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below:
<ul style="list-style-type: none"> • people: age target market; • purpose: function; • appearance: colour, shape; • environment: where will product be used; • safety: for users; • cost: cost of materials;
<i>continued on next page</i>

1.7 generates several alternative solutions and writes notes, ideas that show some links to the design brief and specifications;
makes:1.9 develops a plan for making that outlines all of the following:
<ul style="list-style-type: none"> resources needed; sketches showing the necessary dimensions or quantities; all steps necessary to making the product;
makes:1.9 develops a plan for making that outlines all of the following:
<ul style="list-style-type: none"> resources needed; sketches showing the necessary dimensions or quantities; all steps necessary to making the product (makes);
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;
evaluates:1.13 tests and evaluates the products or systems with objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications;
communicates:1.15 presents ideas using two-dimensional or three dimensional sketches, circuit diagrams or systems diagrams that include all of the following features:
<ul style="list-style-type: none"> use of SA drawing conventions (e.g. dimension lines, labelling, line types, symbols); notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings.
LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
structures:2.1 demonstrate knowledge and understanding of frame structures:
<ul style="list-style-type: none"> the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability);
<i>continued on next page</i>

processing:2.2 demonstrates a knowledge and understanding of how materials can be processed to change or improve their properties by adapting them to suit particular purposes:
<ul style="list-style-type: none"> • to withstand forces (tension, compression, bending, torsion, shear); • to increase strengths or life-span; • how specific properties suitable for packaging can be achieved.
LO 3
TECHNOLOGY, SOCIETY AND THE ENVIRONMENT The learner will be able to demonstrate an understanding of the interrelationships between science, technology and the environment.
This is demonstrated when the learner:
indigenous Technology and Culture:3.1 compares how different cultures have solved similar problems and relates the differences to the culture and values of their societies;
impact of Technology:3.2 expresses and details opinions about the positive and negative impacts of products of Technology on the quality of people's lives and the environment in which they live.

Table 2.21

2.4.7 Memorandum

ACTIVITY 1

1. Each learner has five pages with diagrams such as the one shown below. Allow them to exchange information by means of presentations.

Food Group

Examples

Main Nutrient

Function of Main Nutrient

2. Examples of goals:

- Eat less sugar.
- Eat less fat.
- Eat less salt.
- Eat more fibre.
- Do not overeat.
- Eat a balanced meal.

ACTIVITY 2

This activity covers the technological process. Learners can work in groups of 2 or 3. Groups can draw a map of the country they will represent. Countries such as Spain, Greece, Mexico, the USA, the RSA and France all have well-known fast foods. Make cards with the names of the different countries on them and let the learners draw.

The idea is that the learners will plan and erect a fast food stall for the show.

1. The activity can be done on an A4 page. The name of the members of the company, the name of the business and the logo of the business must appear on the page.

2. Compare the staple food and fast foods of two countries / cultures. A class discussion / summary on the board in order to summarise all the countries' staple foods and fast foods, will be very useful.

3. Photocopy the research pages and give them to the learners to be completed. It is important to give the learners sufficient time for research seeing that a great deal of the research must be done at the businesses themselves.

4. The group must produce ideas of possible fast foods in order to select a final fast food product.

5. During their planning, learners must keep in mind all the facets that have been mentioned in the module. Special emphasis must be placed on the costing and the selling price of the product. Learners will thus be able to calculate the profit per item.

6. Seeing that it is a group presentation, the learners must be thoroughly prepared. Therefore it would be meaningful for the learners to complete a flow chart to illustrate their production line. Encourage learners to decorate their stall (table) and to have a poster with a sketch of their product and its price.

7. If you have the necessary facilities, you could allow the learners to prepare their food in class, but you would have to give them extra time. The other option is that the food can be prepared at home, and only be assembled during the presentation.

8. Learners can write their own evaluation by reading the specifications again and using them as criteria. Learners can evaluate the taste, texture and appearance, and make recommendations and improvements.

An evaluation sheet such as the one that has been attached can be given to the panel:

Company:	
Members:	
Time:	

Table 2.22

Final product:	Mark Out of 10
• Cultural link	
• Nutritional value	
• Originality	
• Quality control	
• Production line effectiveness	
<i>continued on next page</i>	

• Presentation	
• Company spirit	
• Tidiness/hygiene	
• Price control	
• Total impression	
TOTAL MARK (<i>out of 100</i>):	

Table 2.23

Chapter 3

Term 3

3.1 Understanding the nature of electrical current¹

3.1.1 TECHNOLOGY

3.1.2 Grade 8

3.1.3 ELECTRICITY

3.1.4 Module 12

3.1.5 THE NATURE OF ELECTRICAL CURRENT

Electricity

In order to realize how essential electricity is to ones life, just turn off the electricity supply to your home for a while. It is difficult to realize that there are still people who get along without electricity, but usually even those people have battery-driven radios. Fortunately, most homes in South Africa have electricity. This commodity helps to improve people's standard of living.

Activity 1

To demonstrate knowledge and understanding of the nature of electrical current, where it comes from, and the positive and negative impact thereof on the environment

	LO 2.4						LO 3.2			

Table 3.1

ElectronProtonCoreNeutronElectron circuit

The atom is the building block of all material and it consists of the following parts: a core with protons and neutrons, and electrons that revolve in an orbit around the core. Electrons can be separated from the core and are then known as free electrons. When the free electrons move in the same direction, an electron flow (an electrical current) is formed.

There are two kinds of electrical currents, **Alternating Current (AC)** and **Direct Current (DC)**. We mainly use alternating current in our homes for our stoves, refrigerators and lights. The electricity comes from a power-station, but many of the items in the home, for example torches, work with DC that comes from batteries. Many items such as cellular phones use AC to recharge their batteries that provide DC.

¹This content is available online at <<http://cnx.org/content/m23759/1.1/>>.

LO 3
TECHNOLOGY, SOCIETY AND THE ENVIRONMENT The learner will be able to demonstrate an understanding of the interrelationships between science, technology and the environment.
This is demonstrated when the learner:
impact of Technology:3.2 expresses and details opinions about the positive and negative impacts of products of technology on the quality of people's lives and the environment in which they live.

Table 3.3

3.1.7

3.1.8

3.1.9 Memorandum

ACTIVITY 1

- The emphasis should be on the origin of electricity, namely the atom. Learners should also become thoroughly acquainted with the difference between AC and DC.

Assignment 1

- 1.1 Emits light and warmth. Can be used in electrical appliances, e.g. TV sets, computers, etc.
- 1.2 AC
- 1.3 220V
- 1.4 ESKOM
- 1.5 Nuclear power stations, hydroelectricity, coal-driven power stations, wind turbines.
- 1.6 Nuclear power: nuclear waste; radiationHydro power: disrupts ecologyCoal: smoke pollutionWind turbines: intrudes on the landscape
- 1.7 The emphasis should be on power lines, substations and transformers.

3.1.10

3.2 Safety measures concerning electricity²

3.2.1 TECHNOLOGY

3.2.2 Grade 8

3.2.3 ELECTRICITY

3.2.4 Module 13

3.2.5 SAFETY MEASURES CONCERNING ELECTRICITY

Activity 1

To familiarize learners with safety measures concerning electricity

	LO 1.12			

²This content is available online at <<http://cnx.org/content/m23761/1.1/>>.

Table 3.4

You have possibly already experienced an electrical shock. If so, you will have found out that it has an impact on your body. The power of the electrical current determines the shock on your body – if the body is unable to handle the shock, you may die. Therefore it is important for your safety and that of other people that certain measures are observed when working with electricity.

Most electrical appliances are earthed in order to safeguard you. Earthing is essential seeing that it leads the current away to the ground in case of an electrical short-circuit. This prevents a person from being shocked by the appliance if he/she were to touch it. The electrical appliance is connected to the earth so that electric power will be discharged immediately and without any danger.

Assignment 1

2.1 Mention four safety measures that should be applied at all times.

2.2 What should you do if someone suffers an electric shock?

2.3 Make a sketch in colour of an electrical plug to illustrate the correct coupling.

2.4 In an electrical plug, why is the earth pin longer than the other two pins?

2.5 Produce an A4 poster that illustrates a safety measure. Insert it as an extra page.

	LO 1.12			

Table 3.5

Focus task 1

You now have the opportunity to couple an electrical plug to an electrical cord. The sketch shows you how to remove the isolating material. Your teacher will guide you with the actual coupling.

**Figure 3.1**

3.2.6 Assessment

Learning outcomes(LOs)
<i>continued on next page</i>

LO 1
TECHNOLOGICAL PROCESSES AND SKILL The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
Assessment standards(ASs)
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.2 compares existing products relevant to the problem situation based on: <ul style="list-style-type: none"> • safety; • suitability of materials; • fitness for purpose; • cost;
1.3 develops and performs practical tests in the technological knowledge areas (structures, processing and systems and control);
1.4 uses appropriate technologies and methods to: <ul style="list-style-type: none"> • collect relevant data from different sources or resources; • extract relevant data; • make meaningful summaries; • use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below: <ul style="list-style-type: none"> • people: age, target market, human rights, access; • purpose: function, what product will do; • appearance: colour, shape; • environment: where the product will be used or made, impact on the environment; • safety: for users and manufacturers; • cost: cost of materials, wastage, cost of manufacture, maximum selling price;
<i>continued on next page</i>

1.7 generates several alternative solutions and writes notes, ideas that show links to the design brief, specifications and constraints;
1.8 chooses possible solutions based on well-reasoned argument and develops the chosen idea to include more specific details using graphic and / or modelling techniques;
<p>makes:1.9 develops a plan for making that includes all of the following:</p> <ul style="list-style-type: none"> • resources needed ; • sketches showing the necessary dimensions or quantities; • all the steps necessary to make the product;
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;

Table 3.6

3.2.7 Memorandum

ACTIVITY 1

Becoming acquainted with safety precautions concerning electricity. LO 1.12

- Learners should gain a thorough understanding of the dangers of electricity. If electricity is not used with the necessary caution, its use can be fatal. In Focus Task 1, you could use electric wire without a power supply. All learners should be given an opportunity to plug in a power plug/wall plug.

Assignment 2

1. Do not overload wall plugs.Ensure that electrical; cords are in good condition.Avoid using electricity near water.Avoid joining electrical cords.
2. Switch off the power supply.Use non-conducting materials to free the person from the power supply and pull the victim away by his/her clothing.If the victim is unconscious, mouth-to-mouth resuscitation should be applied.
3. L — brownN — blueE — green and yellow
4. current and the cover of the appliance, it is necessary to lead the current to the earth to avoid an electrical shock if anybody should touch the appliance.
- 5.. Learners' own attempts.

3.3 Circuits, conductors and isolators³

3.3.1 TECHNOLOGY

3.3.2 Grade 8

3.3.3 ELECTRICITY

3.3.4 Module 14

3.3.5 CIRCUITS, CONDUCTORS AND ISOLATORS

Activity 1

To

³This content is available online at <<http://cnx.org/content/m23762/1.1/>>.

- master the basic knowledge of circuits, conductors and isolators
- do practical tests in the area of systems and control
- draw an electric circuit diagram

[illegible]

Table 3.7

In a system each part has a function to fulfill in order to make the system work. Electrical systems are no different. Each part, in this case called the **component**, has a specific function. The components cannot function separately and must be linked to one another in what we call a **circuit**.

A circuit must have a power source, e.g. a battery, it must be closed and it must have a function, e.g. a light bulb that emits light. You will be working with very simple systems in this module.

Certain materials are suitable to conduct electricity well and are used in circuits. They are known as **conductors**. Examples of conductors are silver, copper, aluminium and gold. You entrust your life to **isolators** every day, for example when you touch the electrical cord of a hair-drier. Isolators are materials that do not conduct electricity, because they do not contain any free electrons. Examples are rubber, PVC and asbestos.

Assignment 1:

- Your educator will give you a simple circuit with a light bulb with which you can test the following items to see whether they are isolators:



Figure 3.2

Item	Material	Isolator	Conductor
Ruler			
Nail			
Paper clip			
Wool			
Cardboard			
Tin foil			

Table 3.8

- When an electric current flows, it has mainly three effects, namely

- a heating effect;
- a magnetizing effect; and
- a chemical effect.

If you open a radio, you will see a lot of coloured components on green boards. These advanced circuits and the lay-out are designed with the aid of a computer. Before the construction of a circuit can be started, a circuit diagram has to be drawn to indicate the exact lay-out. We are going to examine only a few basic components that will enable us to design and manufacture a simple circuit for an article. We classify the components according to their function in three categories, namely **Input**, **Process** and **Output**.

Input	Process	Output
Push-button switch	Resistor	Light bulb
Cell	Adjustable resistor	LED*
Battery		Buzzer
Sliding switch	Diode	

Table 3.9

*LED stands for “Light Emitting Diode”, thus a diode that emits light. A diode is a little apparatus that allows current to flow in one direction only, therefore it can only be coupled in one way in the circuit.

Assignment 2

1. Draw a simple circuit that contains the following components:

BATTERY, SLIDING SWITCH, LIGHT BULB, CONDUCTOR

2. Provide two examples of each where the heating effect, magnetizing effect and chemical effect of an electrical current are applied.

	LO 1.3						LO 2.4						LO 2.1						

Table 3.10

3.3.6 Assessment

Learning outcomes(LOs)
LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
<i>continued on next page</i>

Assessment standards(ASs)
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.2 compares existing products relevant to the problem situation based on: <ul style="list-style-type: none"> • safety; • suitability of materials; • fitness for purpose; • cost;
1.3 develops and performs practical tests in the technological knowledge areas (structures, processing and systems and control);
1.4 uses appropriate technologies and methods to: <ul style="list-style-type: none"> • collect relevant data from different sources or resources; • extract relevant data; • make meaningful summaries; • use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below: <ul style="list-style-type: none"> • people: age, target market, human rights, access; • purpose: function, what product will do; • appearance: colour, shape; • environment: where the product will be used or made, impact on the environment; • safety: for users and manufacturers; • cost: cost of materials, wastage, cost of manufacture, maximum selling price;
<i>continued on next page</i>

1.7 generates several alternative solutions and writes notes, ideas that show links to the design brief, specifications and constraints;
1.8 chooses possible solutions based on well-reasoned argument and develops the chosen idea to include more specific details using graphic and / or modelling techniques;
<p>makes:1.9 develops a plan for making that includes all of the following:</p> <ul style="list-style-type: none"> • resources needed ; • sketches showing the necessary dimensions or quantities; • all the steps necessary to make the product;
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;
<p>evaluates:1.13 tests and evaluates the products or systems with objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications;</p>
<p>communicates:1.14 presents ideas (in a project portfolio) using two-dimensional or three-dimensional sketches, circuit diagrams or systems diagrams that include all of the following:</p> <ul style="list-style-type: none"> • conventional drawing conventions (e.g. dimension lines, labelling, line types, symbols); • notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings (e.g. colour, shade, texture, shadow, thick and thin lines).
Learning outcomes(LOs)
LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
<p>structures:2.1 demonstrate knowledge and understanding of frame structures:</p> <ul style="list-style-type: none"> • the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); • reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); • how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability; <p>systems and control:2.4 demonstrates knowledge and understanding of how electrical circuits with more than one input or control device will work based on different logic conditions (“AND” and “OR” logic), and represents them using circuit diagrams, systems diagrams and truth tables.</p>

Table 3.11

3.3.7**3.3.8****3.3.9****3.3.10 Memorandum**

Assignment 1

- Build the following circuit. Two clamps could be used for holding components in position. The results should produce the following:

Item	Material	Isolator	Conductor
Ruler	Perspex	Yes	No
Nail	Steel	No	Yes
Paper Clip	Copper	No	Yes
Wool	-	Yes	No
Cardboard	-	Yes	No
Tin foil	Aluminium	No	Yes

Table 3.12

Assignment 2 CIRCUITS

2.

Heating: heater, hot water cylinder
 Magnetic: electric motor, domestic doorbell, indicator lights of a car,
 Chemical: swimming pool chlorinator, covering objects in metal/electrode

3.4 Important measuring units⁴**3.4.1 TECHNOLOGY****3.4.2 Grade 8****3.4.3 ELECTRICITY****3.4.4 Module 15****3.4.5 IMPORTANT MEASURING UNITS**

Activity 1

To be able to explain the most important measuring units and their mutual connection

	LO 2.4			

Table 3.13

⁴This content is available online at <<http://cnx.org/content/m23764/1.1/>>.

We have already said that an electrical current is the flow of electrons in a circle. The speed at which the electrons flow, is measured in **Ampère**. In order to measure amperage, one must allow the current to flow through an Ammeter.

The battery supplies the energy that is also called the **electromotive force (EMF)**. It is measured in **Volts**. In order to measure voltage one must place the two points of a voltmeter on either side of a component.

Resistance is offered against the flow of the current and the resistance is measured in **Ohms**.

A battery does not provide its full energy because some of its energy is lost. This is called power and it is measured in **Watts**.

Ohm's law states that the current through a resistor is directly proportional to the tension that is coupled over a resistor, i.e. the current is directly proportional to the tension and inversely proportional to the resistor. It is formulated as follows:

$$I = V / R$$

Actuation is the energy that must supply the battery and is wasted as heat in a resistor. It is formulated as follows:

$$P = V \times I$$

- Summary of electrical units

	Symbol	Unit	Abbreviation
TENSION	V	Volt	V
CURRENT	I	Ampère	A
RESISTANCE	R	Ohm	'
POWER	P	Watt	W

Table 3.14

The formulas make it possible for one to determine units through mathematical computations, e.g. if one has the Volts and Ampère of a circuit, one can calculate the power. Nowadays we use advanced apparatus to measure current, tension and resistance.

- The multimeter is such a device. If your school owns one, you will have the opportunity to take readings with it.

Assignment 1

1. Provide two more formulas that can be derived from the formula $I = V / R$.
2. Provide two more formulas that can be derived from the formula $P = V \times I$.

	LO 2.4			

Table 3.15

3.4.6 Assessment

Learning outcomes(LOs)
LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
<p>structures:2.1 demonstrate knowledge and understanding of frame structures:</p> <ul style="list-style-type: none"> • the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); • reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); • how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability; <p>systems and control:2.4 demonstrates knowledge and understanding of how electrical circuits with more than one input or control device will work based on different logic conditions (“AND” and “OR” logic), and represents them using circuit diagrams, systems diagrams and truth tables.</p>

Table 3.16

3.4.7 Memorandum

- The following definitions are important:
- Electric current: Flow of electrons in a closed circuit
- Voltage: Electromotive force that enables the flow of electric current
- Resistance: Quality of materials offering resistance to the flow of electric current.
- Power: The energy that a battery has to provide and which is used in a resistor.

Ohm’s law:

- This states that the current passing through a resistor is directly proportional to the potential difference, or voltage, across the resistor, i.e. the current is directly proportional to the linked voltage and inversely proportional to the resistance.

Assignment 1

1. $V = I \times R$ and $R = V/I$
2. $V = P/I$ en $I = P/V$
3. $R = V/I = \frac{3}{1,5} = 2 \text{ ohm}$
4. $P = V \times I = 3V \times 1,5A = 4,5 \text{ watt}$

3.5 Series and parallel connections⁵

TECHNOLOGY

Grade 8

ELECTRICITY

Module 16

⁵This content is available online at <<http://cnx.org/content/m31700/1.1/>>.

SERIES AND PARALLEL CONNEXIONS

Activity 1

To gain knowledge about series and parallel connections by doing practical tests

[LO 1.3]

In a series connection the components are connected in line, one after the other. In a parallel connection the components are connected next to each other. The way in which the components have been connected has a great influence on the delivery of the circuit. In order to understand the result of this kind of connection properly, it is best to look at a few circuits. Your teacher will supply you with the components you need to build the following circuits, either on self-made boards or on bread-boards.

Assignment 1

Construct the following circuits and describe the result on the output component. You may use either a light bulb or LED as output component. Remember that the long pin of the LED is positive. Your teacher will also give you the proper resistor size to protect the LED. If you have a multimeter, you will be able to take readings of the Volts, Ampères and Ohms.

Cells in series

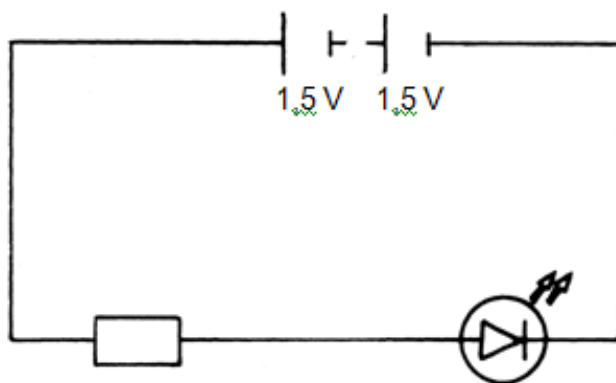


Figure 3.3

a) What is the total voltage of the battery?

b) What happens if one cell is removed?

The light bulb / LED shines

brightly

dimly

very dimly

(underline the correct answer)

2. Cells in parallel:

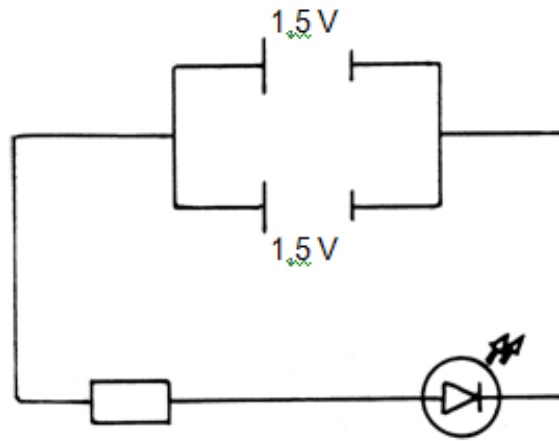


Figure 3.4

a) What is the total voltage of the battery?

b) What happens if one cell is removed?

The light bulb / LED shines

brightly

dimly

very dimly

(underline the correct answer)

3. Light bulbs / LEDs in series:

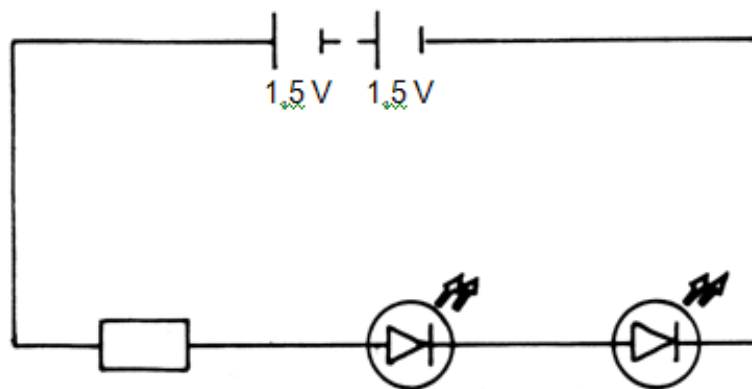


Figure 3.5

- a) What happens if one light bulb / LED is removed?
 - b) What happens if one more light bulb / LED is added using the same kind of connection?
 - c) What is the total voltage of V1 and V2 together?
4. Light bulbs / LEDs in parallel:
-

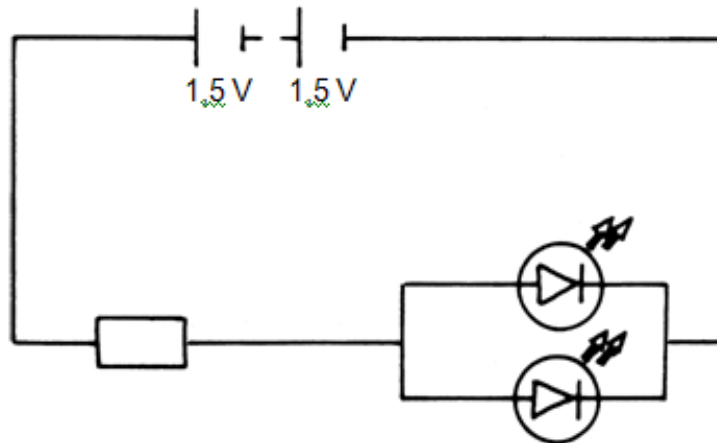


Figure 3.6

- a) What happens if one light bulb / LED is removed?
 - b) What happens if one more light bulb / LED is added using the same kind of connection?
 - c) What is the total voltage of V1 and V2 together?
5. Resistors in series:

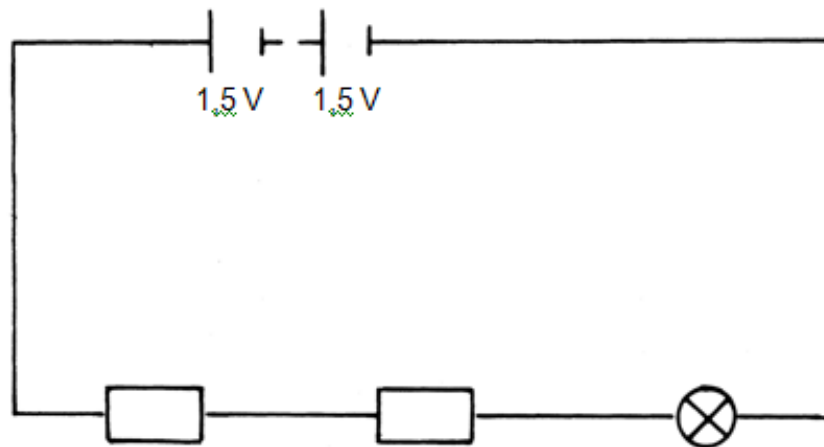


Figure 3.7

- a) What is the function of the resistors?
- b) What is the total resistance in the circuit?

Focus Task 1

To master the skill of soldering

[LO 1.10]

Your teacher will give you more information on soldering and also demonstrate how it is done. Soldering wire is a combination of tin and lead. This means that the smoke that is emitted during the soldering process is bad for your health. Try to inhale as little as possible of this smoke.

Apply all safety measures.

Demonstrate your soldering skills by soldering a simple form from wire. A few examples are given below.

Examples of soldering:

Steps in making a wire figure

1 Bend / bind wire.

2 Solder arms.

3 Add extra shapes.

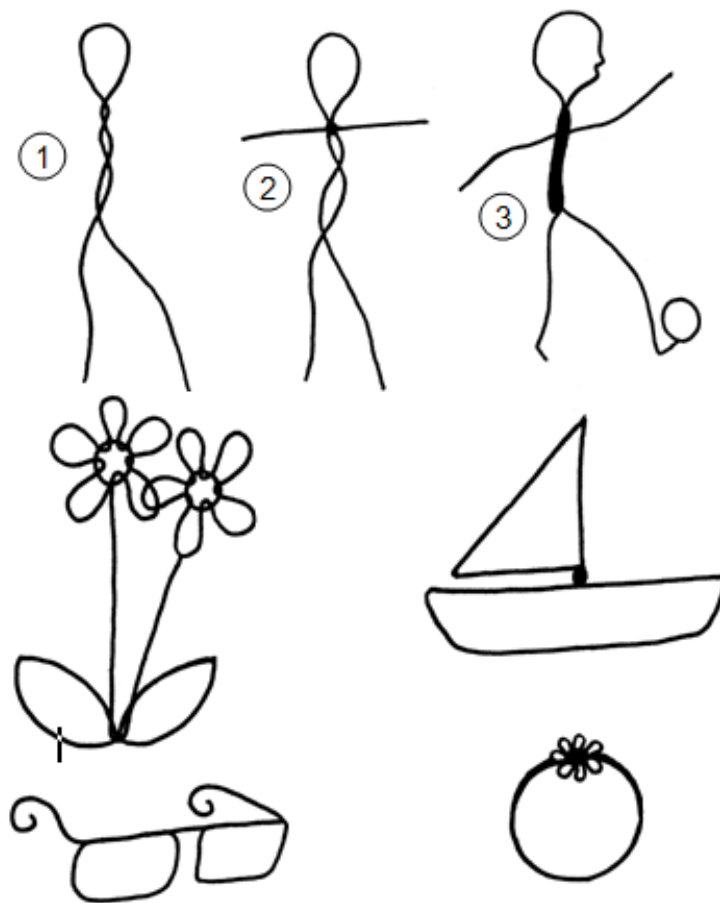


Figure 3.8

Situation 1

You have been asked to design a Steady-Hand Game that can be used to improve children's hand-eye coordination. You may use a 3 volt light bulb or a standard LED or 3 volt buzzer – this will switch on when the probe touches the metal frame.

Components required for a circuit.

- 1 Metal form – bend wire in form as required. (You may use a soldering rod.)
- 2 Probe – can also be made of soldering rod.
- 3 LED – the common 3 volt type (or a 3V light bulb).
- 4 Connector – a single connector cut from a strip.
- 5 3 Volt battery container with wires attached.
- 6 Connector – double connector cut from strip.
- 7 Wire – to connect the handle to the circuit.

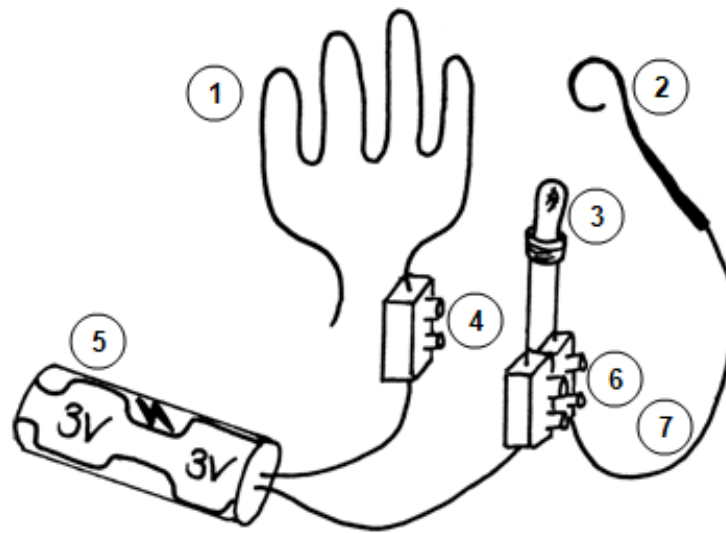


Figure 3.9

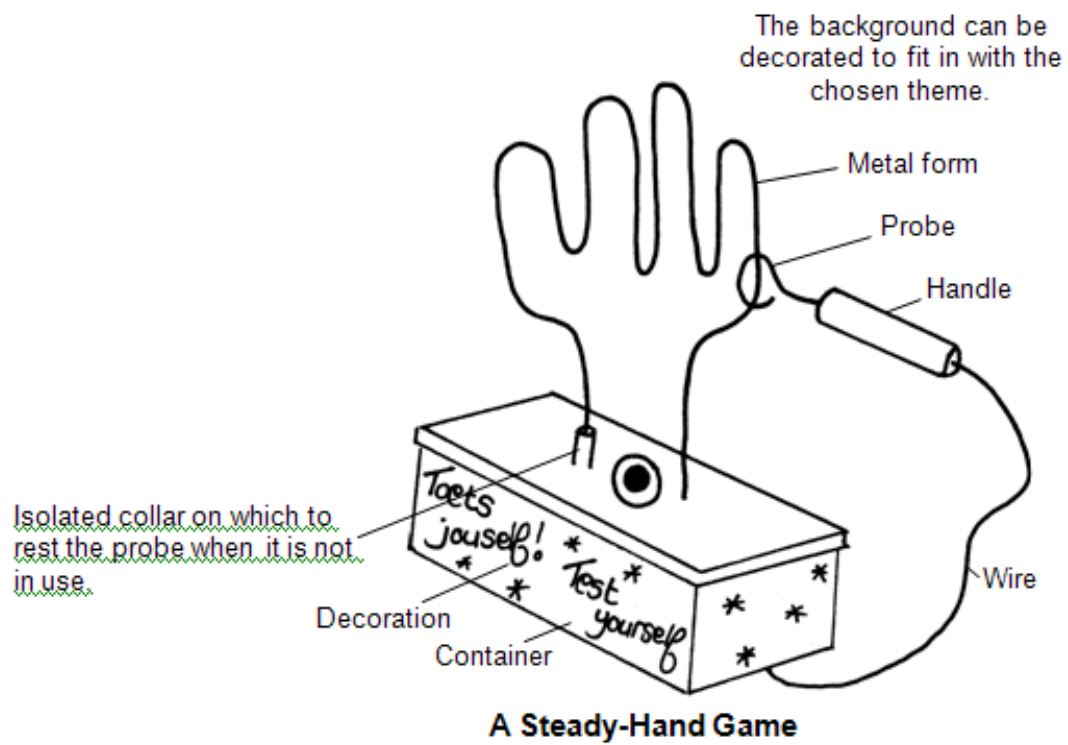


Figure 3.10

Situation 2

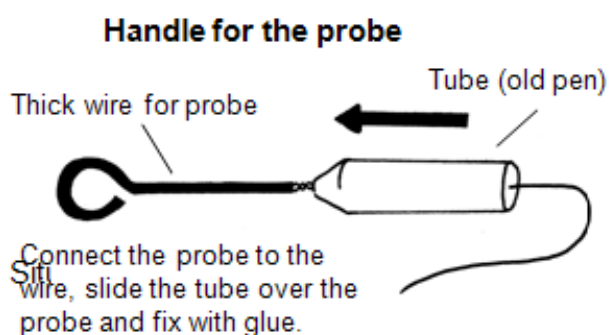


Figure 3.11

We are all aware that smoking is bad for one's health. Even passive smokers are greatly harmed by people who smoke in their presence. Use an old medicine bottle to manufacture an anti-smoking sign. The drawing must contain a circuit that will draw the attention of smokers. You can make use of a flickering LED to make the sign more effective.

Assessment

Learning outcomes(LOs)
LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDINGThe learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
structures:2.1 demonstrate knowledge and understanding of frame structures:the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties);reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members);how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability;systems and control:2.4 demonstrates knowledge and understanding of how electrical circuits with more than one input or control device will work based on different logic conditions ("AND" and "OR" logic), and represents them using circuit diagrams, systems diagrams and truth tables.

Table 3.17

Memorandum

Learners have to discover this through practical experience. Many schools still have wooden boards that are suitable for this practical exercise. The breadboards are also very suited, as circuits can be built very quickly. In this instance, LEDs can be used in the place of light bulbs. This also provides an ideal opportunity to use the MultiMate. Learners could take readings while they are working.

Note that the long arm is positive and the short arm negative. The components therefore have to be linked correctly and be protected by a resistor.

Assignment 1

1. a) $1,5\text{ V} + 1,5\text{ V} = 3\text{ V}$
b) The output glow is duller.
2. a) $1,5\text{ V}$
b) No noticeable effect, but battery will discharge faster. Dull
3. a) The others do not glow.
b) All glow more dully.
c) 3 V (if the input is a 3 V battery, there is no resistance)
4. a) The other one continues to glow.
b) All will glow equally brightly.
c) 3 V (if input is a 3 V battery, there is no resistance.)
5. a) It protects the LEDs in the circuit.
b) $R_1 + R_2 = R_T$ (formula for serially-linked resistors)

Focus Task 1:

Soldering:

The following sketch illustrates the basic requirements for soldering. The solder is an alloy of lead and tin. It contains its own flux which allows the solder to flow freely.

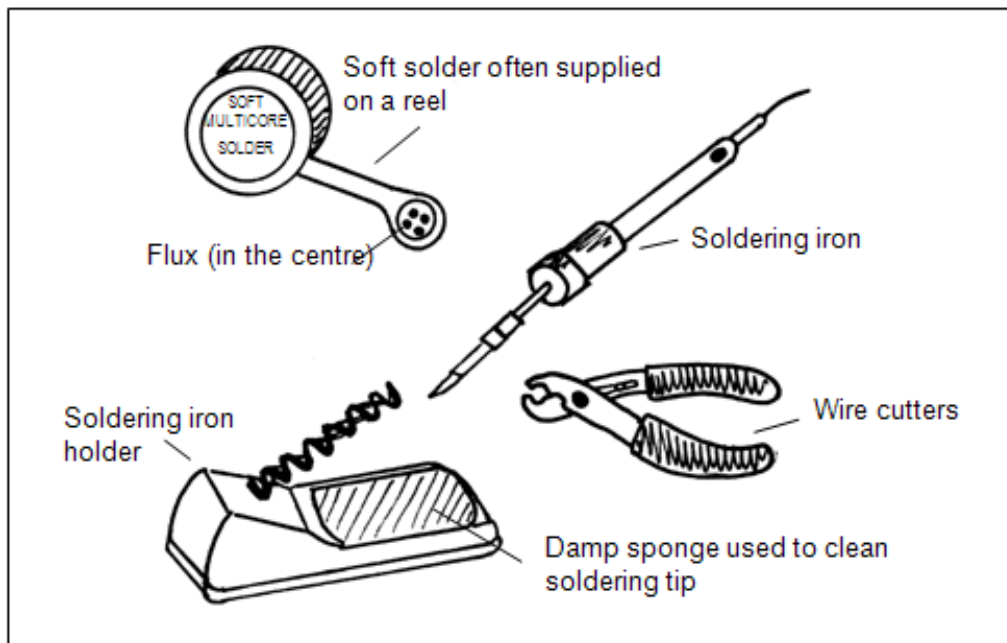


Figure 3.12

Situation 1

The following examples provide an idea of what the learners' ideas should lead to (a wooden board of $150\text{ mm} \times 60\text{ mm} \times 22\text{ mm}$ could be used as a base). If learners wish to add a background, a saw may be used to cut a 3-mm groove in the board, for inserting a piece of hardboard as backing. Motifs that suit the wiring (theme) may be painted on this background, or suitable pictures may be pasted on it.

Situation 2

Learners could make use of waste containers, like plastic bottles, to cut out motives, e.g. a pair of lungs, and draw in details using fibre-tipped pens with permanent colours. The circuit could be built on strip board, using long wires for linking the battery, so that the battery can remain outside the bottle. The circuit board can be inserted into the bottle if the back of the bottle is cut open.

In both instances learners have to identify and formulate the problems that arise in the given situation. They have to write their own design proposals and the educator could stipulate specifications according to the nature of the class, materials, equipment and available components. The learners' ideas might include different circuit layouts as well as different designs. The educator will have to evaluate their models accordingly.

Each learner has to produce a portfolio and design a cover page for it.

The following steps have to be followed during soldering:

Ensure that no movement occurs where the wires are being joined (a "third hand" will be needed).

Heat the join with the soldering iron.

Place some soldering flux on the join.

There should be a shiny join when the wire has cooled down.

Take note:

The surfaces to be joined must be clean.

Allow 3 to 5 seconds for the heating of the join.

Use a soldering iron of appropriate size for your work.

A practical suggestion: When two wires are to be joined by soldering, the two separate ends could be soldered before being joined together — this is known as sweating. Use old printed circuit boards (PCBs) for practising soldering.

Chapter 4

Term 4

4.1 Our land - a garbage dump¹

4.1.1 TECHNOLOGY

4.1.2 Grade 8

4.1.3 RECYCLING

4.1.4 Module 17

4.1.5 OUR LAND – A GARBAGE DUMP

Our land - A garbage dump?

In the typical South African household people haul bags of waste out to the rubbish bin which is collected by municipal crews in waste removal trucks. Is this the end of it?

As the population of South Africa increases by the day, so too do the mountains of waste. This results in too much waste for the landfills that municipalities operate. Luckily there are people who are concerned about where all this waste goes and where it will go in future.

Recycling is not the only solution to the waste problem but it is something everybody can do to help make the world a better place. It involves the re-use of household and industrial materials, such as plastic and paper products. It not only helps to cut waste, but also reduces our use of resources and lessens the pollution that results from processing those sources. Many people in South Africa collect recyclable material like paper, glass, plastic and metal to earn money. Others simply throw their recyclable waste in special containers to be recycled. It does not matter how you help the process of recycling materials, as long as you do it. It is good for the environment.

Activity 1

To demonstrate knowledge and understanding of what recycling is and the route rubbish should go

	LO 1.1			

Table 4.1

1.1 Define the term “recycling”.

¹This content is available online at <<http://cnx.org/content/m23765/1.1/>>.

1.2 Draw a flow-chart of the route plastic, glass, paper and metal waste normally follows from the shop to the landfill.

1.3 Draw a flow-chart to indicate the route that waste containers should follow to help save our environment.

1.4 Draw the recycling emblem on a folio paper.

1.5 Write a paragraph entitled: **Reasons for recycling.**

Activity 2

To perform tests to see what materials and what quantities of waste are generated at home in order to form an opinion about the impact of products of technology on the quality of people's lives and the environment in which they live

	LO 3.2			

Table 4.2

- Take three empty cardboard boxes and label them PAPER, METAL (CANS) and PLASTIC. Collect and weigh recyclable waste for one week in your home and place it in these boxes. Use the table below and weigh the amount of waste each day. Place the waste in three different bags after you have weighed it and place them in mass waste containers in your town.

Table 1

Household Recycle Data

Recyclable waste	Sun	Mon	Tue	Wed	Thurs	Fri	Sat	Total	
Metal (kg)									
Paper (kg)									
Plastic (kg)									

Table 4.3

Combine the data of all members of the class and calculate the total kilograms of waste collected by the class. In table 2 you can now calculate the total value of the waste your class has collected.

Table 2

Household Recycle Data

Recyclablewaste	Total Quantity (kg)	Price per KG	Total	
Metal (aluminium)		R8,20		
Paper		55c		
Plastic		85c		

Table 4.4

- 2.1 Calculate how much a person will earn who collects 750 kg of metal a week.
 2.2 Design a graph to illustrate the data from table 2.
 2.3 Which material creates the most waste?
 2.4 Which material is the most profitable to collect and sell?

Activity 3

To demonstrate an understanding of how materials (plastics) can be recycled

	LO 2.2			

Table 4.5

- Plastics are more difficult to recycle than other materials. The reason is that there are different types of plastics and that plastic is not a natural material. Most plastics are, therefore, non-biodegradable. When a plastic container reaches a landfill it will not corrode or rust in the course of time.
- Many plastic products are marked to help consumers tell which plastics can be recycled. The recycling process for plastic normally involves cleaning it, shredding it into flakes, then melting the flakes into pellets which can be melted into a final form like plastic milk crates, car carpets etc. Burning plastics emit poisonous or irritating fumes which add to air pollution. Because the recycling of plastics is so problematic only about 5% to 10% of plastics are recycled. Researchers are working to develop biodegradable plastics that will disintegrate due to bacterial action or exposure to sunlight.

3.1 Explain the term “non-biodegradable”.

3.2 List products that are packed in plastic containers.

3.3 Why is plastic such a popular material for packaging?

3.4 Write a paragraph on why plastic waste is such a major problem.

Activity 4

To demonstrate an understanding of how materials (glass) can be recycled

	LO 2.2			

Table 4.6

- Glass is a strong, transparent material which is used for windows, bottles, glasses etc. It has some unusual properties – it melts easily, is chemically inactive and is cheap because its main ingredient is sand.
- In many towns and cities there are bottle banks where one can throw away ones glass waste. Some places even have two separate containers: one for coloured glass and the other for white glass. The glass is taken to a recycling plant where it is cleaned and then crushed. The waste glass is called “cullet” and melts at a lower temperature than the raw materials of glass. This saves energy and raw material. Many companies give a deposit on their empty bottles which is even better than what is paid by a recycling plant.

4.1 Name two advantages of glass.

4.2 Name the disadvantages of glass that you can think of.

4.3 What makes the glass used in a motor-car different?

4.4 What is glass fibre?

Activity 5

To demonstrate an understanding of how materials (paper) can be recycled

	LO 2.2			

Table 4.7

- Every day people throw away tons of paper. There are ways of collecting paper and using it to make new paper. To recycle waste paper so that it is as white as writing paper, any printing ink on the waste has to be removed. The waste is collected in bales and shredded into small pieces. It is then fed into a pulper. Here hot water and chemicals help to separate the paper fibres and remove the ink. Caustic soda is usually used for this purpose. Poorer quality paper like that used for newspapers is mixed with water to form pulp which can be fed in to a paper-making machine.
- Paper is made from wood. About 35 million trees could be saved each year if 75% of waste paper and cardboard were recycled into pulp and used to make new paper. In some tropical countries large areas of hardwood forest have been cleared of mature trees. This is called “deforestation”. This can be very harmful to the environment because the soil can now be washed away by the tropical rains.
- Trees provide oxygen which we all need for survival. They also provide shelter and homes for many animals. Luckily re-forestation is taking place in many parts of the world. Trees are one of the natural resources that can be replaced by planting new trees.

- Explain the terms “deforestation” and “re-forestation”.

5.2 Give two examples each of hardwood and softwood.

5.3 Give one example of an indigenous tree found in South Africa.

- Why do you think the Knysna area is well-suited for forests?
- How can one tell how old a tree is?
- Take an old map and make an envelope out of it.

Activity 6

To demonstrate an understanding of how materials (metals) can be recycled

- Steel is the material that is recycled most. Scrap steel is placed in a furnace and melted by electricity that arcs between two carbon electrodes. Limestone and other materials are added to the molten steel to remove impurities. The steel produced is mostly used for beams and thick plate.
- The recycling of aluminium is very important because most of the ore required to produce aluminium must be imported. There are many different kinds of aluminium – up to 15 different kinds. Most beer cans, cooldrink cans and food cans are made from aluminium. Cans brought to collection centres are crushed, baled, and taken to a mill. Here they are melted and formed into bars. These bars are rolled into sheets and cut into disks from which cans are formed.

6.1 Name five different kinds of metal.

6.2 In which format can steel be bought? Make sketches of the shapes.

- Make a list of products that are sold in cans.

6.4 Make a production diagram of the photo's from a food can company.

Activity 7

To form an understanding of what incineration and landfills are and to understand the positive and negative impact of these on the environment

- Most of our waste goes to landfills. A landfill is a dumpsite where soil is used to cover the waste, so as to prevent the waste from blowing away and to keep down odours. For this process heavy machinery is needed to dig the holes and to cover the waste. In some countries these areas must have thick liners to prevent toxic liquids from leaking out. Unfortunately this is not yet enforced in South Africa. This means that there is a possibility that underlying groundwater can be polluted by leaking liquid. People further object to landfills for a number of reasons; they anticipate waste being blown about, foul odours, rodent infestations, increased truck traffic and lowered property values.
- Many municipalities have invested in incinerators. These gigantic ovens burn tons of waste to ash. Incinerators use the heat from burning waste to produce steam which is used to drive turbines to produce electricity. Incinerators require less land than waste dumps and they do not pose a potential threat to groundwater. Incinerators have drawbacks:
 - Toxic air pollution.
 - Disposal of the ash.
 - More expensive than landfills.
 - The use of incinerators undermines recycling programmes.

7.1 Name two advantages of incinerators and two of landfills.

- Name two disadvantages of incinerators and two of landfills.
- Explain why the use of incinerators undermines recycling. Situation

Your younger brother is turning five. He desperately wants a lampshade with his favourite cartoon character for his room. As it turns out, there are no lampshades available in the shape of that character. Your parents desperately need your help to design and make this present.

Problem:	Identify the problem in the situation.	LO 1.1
Design brief:	Write a design brief.	LO 1.5
Specification:	Your educator will give you some and you can add your own.	LO 1.6
Research:	Do research on different designs of lampshades.	LO 1.4
Ideas:	Get ideas for different shapes and designs.	LO 1.7
Idea selection:	Give reasons for your selection.	LO 1.8
Manufacturing process:	Make a flow chart.	LO 1.9
Realization:		LO 1.10
Evaluation:		LO 1.13

Table 4.8

4.1.6 Assessment

Learning outcomes(LOs)
LO 1
TECHNOLOGICAL PROCESSES AND SKILLS The learner will be able to apply technological processes and skills ethically and responsibly using appropriate information and communication technology.
Assessment standards(ASs)
This is demonstrated when the learner:
investigates:1.1 investigates the background context, the nature of the need, the environmental situation, and the people concerned when given a problem, need or opportunity set in a nationally relevant context;
1.2 compares existing products relevant to the problem situation based on: <ul style="list-style-type: none"> • safety; • suitability of materials; • fitness for purpose; • cost;
1.3 develops and performs practical tests in the technological knowledge areas (structures, processing and systems and control);
1.4 uses appropriate technologies and methods to: <ul style="list-style-type: none"> • collect relevant data from different sources or resources; • extract relevant data; • make meaningful summaries; • use information to justify and support decisions and ideas;
designs:1.5 writes or communicates a short and clear statement or a design brief in response to a given identified situation for the development of a product or system;
1.6 lists product and design specifications and constraints for a solution to an identified or given problem, need or opportunity based on most of the design key words listed below: <ul style="list-style-type: none"> • people: age, target market, human rights, access; • purpose: function, what product will do; • appearance: colour, shape; • environment: where the product will be used or made, impact on the environment; • safety: for users and manufacturers; • cost: cost of materials, wastage, cost of manufacture, maximum selling price;
1.7 generates several alternative solutions and writes notes, ideas that show links to the design brief, specifications and constraints;
<i>continued on next page</i>

1.8 chooses possible solutions based on well-reasoned argument and develops the chosen idea to include more specific details using graphic and / or modelling techniques;
<p>makes:1.9 develops a plan for making that includes all of the following:</p> <ul style="list-style-type: none"> • resources needed ; • sketches showing the necessary dimensions or quantities; • all the steps necessary to make the product;
1.10 chooses and uses appropriate tools and materials to make products by measuring, marking, cutting or separating, shaping or forming, joining or combining, and finishing different materials accurately using appropriate techniques;
1.12 uses safe working practices and shows awareness of efficient ways of using materials and tools;
evaluates:1.13 tests and evaluates the products or systems with objectivity, based on objective criteria linked to the design brief, specifications and constraints, and suggests sensible improvements or modifications;
<p>communicates:1.14 presents ideas (in a project portfolio) using two-dimensional or three-dimensional sketches, circuit diagrams or systems diagrams that include all of the following:</p> <ul style="list-style-type: none"> • conventional drawing conventions (e.g. dimension lines, labelling, line types, symbols); • notes to clarify and communicate design features and reasoning; enhancement of significant sketches like final solution drawings (e.g. colour, shade, texture, shadow, thick and thin lines).
Learning outcomes(LOs)
LO 2
TECHNOLOGICAL KNOWLEDGE AND UNDERSTANDING The learner will be able to understand and apply relevant technological knowledge ethically and responsibly.
This is demonstrated when the learner:
<p>structures:2.1 demonstrate knowledge and understanding of frame structures:</p> <ul style="list-style-type: none"> • the use and application of basic structural components (columns, beams, arches, buttresses, struts, stays, guys, ties); • reinforcing techniques for frame structures (triangulation, webs and fillets, orientation and cross-sectional area and members); • how frame structures can be made strong (e.g. relationship between the size and the shape of the base, the centre of gravity and stability); <p>systems and control:2.4 demonstrates knowledge and understanding of how electrical circuits with more than one input or control device will work based on different logic conditions (“AND” and “OR” logic), and represents them using circuit diagrams, systems diagrams and truth tables.</p>
<i>continued on next page</i>

LO 3
TECHNOLOGY, SOCIETY AND THE ENVIRONMENT The learner will be able to demonstrate an understanding of the interrelationships between science, technology and the environment.
This is demonstrated when the learner:
impact of Technology:3.2 expresses and details opinions about the positive and negative impacts of products of technology on the quality of people's lives and the environment in which they live.

Table 4.9

4.1.7 Memorandum

ACTIVITY 1

- Recycling: Collection, processing and re-use of materials that would otherwise be thrown away.
- Shop – Home – Bin – Waste bag – Landfill
- Shop – Home – Recycling bins – Process of recycling
- Emblem
- Using recycled materials makes new products cost less.

Requires less energy to make products with recycled materials.

Reduces air pollution.

Decreases the amount of land needed for waste dumps.

Conserves natural resources by reducing the need for new material.

ACTIVITY 2

- Through this activity the learners will collect data and process this data. Learners must be motivated to do this at home so that they can discover how much recyclable material we throw away daily. They can copy the tables in MS Excel which will make it easy to illustrate the data in a graph.

ACTIVITY 3

- Plastics are divided into two main types – thermo softening and thermosetting. These names refer to what happens when plastic materials are subjected to heat.
- Thermo softening plastics become soft and pliable when they are heated and harden again when cooled. This process can be repeated again and again. Examples are PVC, Nylon and Polythene.
- A thermosetting plastic, on the other hand, can be moulded only once - during the manufacturing stage. These plastics are used for heat-resistant objects, such as light fittings, saucepan handles and kitchen work surfaces.

3.1 something that does not decompose naturally

- cool drink bottles, margarine containers, milk bottles, etc.
- cheap, light, durable, coloured easily, etc.
- One of the problems is that any of seven categories can be used for containers alone. For effective recycling, the different types cannot be mixed. The recycling process is also very expensive, for the plastics must first be washed, then shredded into flakes, then the flakes are melted into pellets. For health reasons, recycled plastics are rarely made into food containers.

ACTIVITY 4

4.1 It is transparent, fairly cheap to manufacture, easily formed into bottles and jars and easy to recycle. Special glasses for people with sight problems, as well as mirrors are made.

4.2 It breaks easily and has sharp edges.

4.3 Windscreens are made from laminated glass (glass sandwich) with a layer of plastic in the middle. Other kinds of strong glass include wired glass and bulletproof glass.

- If molten glass is forced through a small hole it can be drawn into very fine fibres which are known as fibreglass. These glass strands are made into thick mats which can be used for several purposes. Glass fibre is used in building boats, and for isolation in homes, etc.

ACTIVITY 5

- More than half of the world's timber is burnt as fuel, most of it within a few kilometres of where it is felled. Half of the world's population use wood for all their cooking and heating. The rest of the world's timber is used in industry for building and paper-making. Most paper is made from soft woods. However, 50% of the wood pulp used to make paper comes from waste wood from the sawmill.
- Deforestation: the cutting of mature trees

Re-forestation: Replacing trees at the same rate at which they are cut down

5.2 Hardwood: Teak, Walnut, Ebony, Oak

Softwood: Pines, Spruce

- Stinkwood (or other indigenous wood)
- Tropical climate, rain throughout the year, mountain range
- In the winter the tree grows slowly and forms a dark ring while in the summer it grows fast and forms a wider and lighter ring. Together the two rings indicate one year of growth.

ACTIVITY 6

6.1 Copper, stainless steel, aluminium, brass, gold, nickel, etc.

6.2 Rods, pipe, tubes, angle-iron, I-beams, sheets

6.3 Beans, beef, corn, peas, fruit, etc.

ACTIVITY 7

7.1 Incinerators: Require less land, and will pollute ground water

Landfills: Prevent waste from blowing away, keep down odours

- Incinerators: Air pollution and expensive to operate

Landfills: Pollute ground water, uses large areas of land

- For incinerators to be profitable you need all the rubbish you can get. Municipalities therefore send all their waste to this machine to keep it running.

Situation:

How to make a lampshade:

- 1) Mix the starch according to the instructions on the pack. Note that all the starch must be used, for it cannot be kept.
- 2) Place the mould, e.g. a bowl, upside down and apply margarine all over it. Tear paper strips and paste them with starch around the bowl, allowing the edges of the squares to overlap.
- 3) Tear more paper strips and cover the rest of the bowl. Tear a circle of paper and paste it on the centre to round it off neatly. Apply at least two layers of paper and allow it to dry well.
- 4) Apply a thick layer of starch over the covered area. You can make patterns on the wet starch. Allow to dry well and slip the lampshade carefully off the bowl and allow to dry.
- 5) You can now spray-paint the shade.
- 6) Cut a hole in the top centre of the shade, just large enough for the flex and bulb holder to pass through.

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